NO Jacket
752
DEC 5 1984
830.T
N S1.22: In 2/982
TMF
OMPLETED
68.

research and development in industry, 1982

funds, 1982
scientists & engineers, january 1983

nsf

surveys of science resources series
national science foundation

detailed statistical tables

NSF 84-325

related publications

Science Resources Studies Highlights

R&D Funds

	NSF No.	Price
"Despite Recession, Companies' Own R&D Funding Rose 13% During 1982"	84-314	-----
"Real Growth in Federal R&D Funds Estimated at 12% in 1984—Largest Increase Since Mid-sixties"	84-302	-----
"Dollar Value of U.S. R&D Expenditures Overseas Declined in 1982"	83-329	-----
"Companies Plan Increases in R&D Spending Through 1984"	83-327	-----
"Defense, General Science, and Transportation Functions Lead 1984 Federal R&D Growth"	83-323	-----
"Defense and Economy Major Factors in 7% Real Growth in National R&D Expenditures in 1984"	83-316	-----

S/E Personnel

	NSF No.	Price
"Science and Engineering Jobs Grew Twice as Fast as Overall U.S. Employment with Industry Taking the Lead"	84-319	-----
"Industry Reports Shortages of Scientists and Engineers Down Substantially From 1982 to 1983"	84-303	-----
"Technical Employment Growth Accelerates in Selected Nonmanufacturing Industries"	83-321	-----
"Manufacturing Employment Becoming Increasingly More Technological"	83-303	-----

Detailed Statistical Tables

R&D Funds

	NSF No.	Price
Research and Development in Industry, 1981. Funds, 1981; Scientists and Engineers, January 1982	83-325	-----
Federal Funds for Research and Development: Fiscal Years 1982, 1983, and 1984, Volume XXXII	83-320	$2.50

S/E Personnel

	NSF No.	Price
Scientists, Engineers, and Technicians in Trade and Regulated Industries: 1982	84-320	-----
Scientists, Engineers, and Technicians in Manufacturing and Nonmanufacturing Industries: 1980-81	83-324	-----

Reports

R&D Funds

	NSF No.	Price
Federal Funds for Research and Development: Fiscal Years 1982, 1983, and 1984, Volume XXXII	84-326	In press
Trends in Small Companies' R&D Expenditures	83-324	-----
Federal R&D Funding by Budget Function: Fiscal Years 1971-84	83-301	-----

S/E Personnel

	NSF No.	Price
Scientific and Technical Work Force in Trade and Regulated Industries Shows Major Shift in Occupational Composition: 1979-82	84-323	-----

Composite

	NSF No.	Price
National Patterns of Science and Technology Resources: 1984	84-311	-----

Availability of Publications

Those publications marked with a price should be obtained directly from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Where no price is listed, single copies may be obtained gratis from the National Science Foundation, Washington, D.C. 20550.

(See inside back cover for Other Science Resources Publications.)

research and development in industry, 1982

funds, 1982
scientists & engineers, january 1983

surveys of science resources series
national science foundation

detailed statistical tables

NSF 84-325

I

AVAILABLE

The National Science Foundation (NSF) has Telephonic Device for the Deaf (TDD) capability which enables individuals with hearing impairment to communicate with the Division of Personnel and Management for information relating to NSF programs, employment, or general information. The TDD number is (202) 357-7492.

contents

Page

General Notes iv

Section:

A. Technical Notes 1
B. Statistical Tables 7
C. Reproduction of Survey Instruments 41

general notes

- Data in this report were collected by the Bureau of the Census (Census) for the National Science Foundation (NSF) in the annual Survey of Industrial Research and Development and cover the periods 1956-82 for funding data and January 1957-January 1983 for personnel data.
- The footnote, "Not separately available but included in total," indicates that data are being withheld either (1) to avoid disclosing the operations of an individual company; or, (2) the imputation rate—the percentage of that statistic estimated by Census—exceeds 50 percent because of the failure of some companies to supply the requested data. See table A-1 for the imputation rates of specific items.
- The industry survey does not cover trade associations. Although their primary mission is to serve industry, trade associations are established as nonprofit organizations and are covered in the NSF survey of independent nonprofit institutions. Research and development (R&D) expenditures of trade associations are estimated at less than 1 percent of the industry R&D total.
- Complete technical notes are contained in section A. Questions regarding these survey findings should be addressed to Melissa Pollak or Mary Burke, Industry Studies Group, Division of Science Resources Studies, National Science Foundation, Washington, D.C. 20550 (202) 634-4648.

section a

technical notes

scope of study

The National Science Foundation (NSF) sponsored its first survey of industrial research and development in 1953. Since then, the scope of the survey has gradually been expanded and refined in response to an increasing need for more detailed information on the Nation's research and development (R&D) effort.

The 1982 industry survey is the 26th in the annual series sponsored by NSF and conducted by the Bureau of the Census (Census), Department of Commerce. NSF also sponsored two industry surveys covering the 1953-56 period, which were conducted by the Bureau of Labor Statistics (BLS), Department of Labor.[1] Data obtained in the BLS survey are not directly comparable with the Census figures for 1957-82 because of methodological and other differences in the surveys conducted by the two agencies. In addition, beginning in 1957, the Census surveys have collected data on the R&D activities of federally funded research and development centers (FFRDC's) operated by business firms, whereas the earlier BLS surveys did not. FFRDC's are organizations administered by industrial, educational, or other institutions on a nonprofit basis; they conduct R&D activities almost exclusively for the use of the Federal Government. R&D expenditures of industry-administered FFRDC's are included in the Federal R&D data under the classifications of the administering firms. Total R&D expenditures and selected personnel data for FFRDC's are shown in table B-12. To account for the performance of these research centers in 1956, Census adjusted data for that year (collected in the 1957 survey) to provide comparable trend data for 1956 and earlier years.

Data on scientific personnel are not directly comparable with data in the surveys formerly conducted by BLS. Census uses the company, defined to include all establishments under common ownership or control, as the basic reporting unit for the survey of industrial research and development. The surveys of scientific and technical personnel conducted by BLS were on an establishment-reporting-unit basis. Further, Census obtains data on the number of R&D scientists and engineers on a full-time-equivalent (FTE) basis, unlike the BLS surveys in which data were provided in terms of scientists and engineers primarily employed in research and development.

Other variations in the two sets of data may be the result of different offices in the same company preparing the estimates or the varying response rates of the two surveys.

The statistics presented in this report are subject to response and concept errors caused by differences between survey and industry concepts and definitions of R&D activities, and by variations in company accounting procedures. Consequently, the accuracy of the data provided by respondents is subject to some variation.

Data quality has improved substantially since the first industry survey in 1953, mainly as a result of more accurate and sophisticated accounting procedures adopted by respondents. In addition, NSF and Census have endeavored to reduce response and concept errors arising from difficulties in interpreting or applying survey definitions.

NSF has been aware of the increased reporting burden placed on industry from all sources in recent years. In an effort to alleviate this burden, the detailed questionnaire (which has been in use with slight modifications since the beginning of the survey) is now mailed only biennially; an abbreviated form containing only the most crucial data elements is sent to survey respondents in the intervening years.

The shortened survey form was used for the first time to collect industrial R&D

---

[1] National Science Foundation, *Science and Engineering in American Industry, Final Report on a 1953-54 Survey* (NSF 56-16) and *Science and Engineering in American Industry, 1956* (NSF 59-50) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1956 and 1960.)

data for 1978. Because all data elements were not collected for 1978, 1980, and 1982 some of the historical tables do not contain data for these years. The main tables affected are those which give detailed breakdowns of R&D expenditures for basic research, applied research, and development by industry and by product field. Some detailed data on energy and pollution abatement R&D activities are also deleted, as well as tables showing company-financed research and development contracted to outside organizations, Federal funds by agency, and R&D expenditures by geographic area.

survey definitions[2]

Research and development—Basic and applied research in the sciences and engineering and the design and development of prototypes and processes. This definition excludes quality control, routine product testing, market research, sales promotion, sales service, research in the social sciences or psychology, and other nontechnological activities or technical services.

Basic research—Original investigations for the advancement of scientific knowledge not having specific commercial objectives, although such investigations may be in fields of present or potential interest to the reporting company.

Applied research—Investigations directed to the discovery of new scientific knowledge having specific commercial objectives with respect to products or processes. This definition differs from that of basic research chiefly in terms of the objectives of the reporting company.

Development—Technical activities of a nonroutine nature concerned with translating research findings or other scientific knowledge into products or processes. Not included are routine technical services to customers or other activities excluded from the above definition of research and development.

Funds for research and development—Operating expenses incurred by a company in the conduct of research and development in its own laboratories or other company-owned or -operated facilities. Includes wages and salaries, materials and supplies consumed, property and other taxes, maintenance and repairs, depreciation, and an appropriate share of overhead, but excludes capital expenditures. All funds for R&D performance are expressed in current rather than in constant dollars.

Federally financed research and development—Receipts for work done by the company on Federal R&D contracts or subcontracts and R&D portions of procurement contracts and subcontracts.

Company-financed research and development—Cost of the company-sponsored research and development performed within the company. Does not include company-financed research and development contracted to outside organizations, such as research institutions, universities and colleges, or other nonprofit organizations.

R&D scientists and engineers—The January number of those engaged full time in research and development and the full-time-equivalent (FTE) of those working part time in research and development. Scientists and engineers are defined as persons engaged in scientific or engineering work at a level which requires a knowledge of physical, life, engineering, or mathematical sciences equivalent at least to that acquired through completion of a 4-year college program with a major in one of those fields.

Employment—Total number of persons domestically employed by the company in all activities during the pay period which includes the 12th of March. These data are not completely comparable with employment of R&D scientists and engineers data which are collected as of January.

Net sales and receipts—Recorded dollar values for goods sold or services rendered by a company to customers outside the company, including the Federal Government, less such items as returns, allowances, freight, charges, and excise taxes. Excludes domestic intracompany transfers as well as sales by foreign subsidiaries, but includes transfers to foreign subsidiaries and export sales to foreign companies. For companies classified in the communication equipment industry (SIC 366), manufacturing sales are included and revenues from their telecommunication activities are excluded. Net sales and receipts figures are expressed in current dollars rather than in constant dollars. All tables which include net sales figures, with the exception of table B-17, do not include data for nonmanufacturing companies.

Geographic area covered—Includes only those operations located in the 50 States and the District of Columbia.[3]

explanation of tabular data

Industry classification—Industries and industry groups shown separately in the statistical tables are classified according to their Standard Industrial Classification Manual[4] codes as follows:

- Food and kindred products (20)
- Textiles and apparel (22, 23)
- Lumber, wood products, and furniture (24, 25)
- Paper and allied products (26)
- Chemicals and allied products (28)
    - Industrial chemicals (281-82, 286)[5]
    - Drugs and medicines (283)
    - Other chemicals (284-85, 287-89)[5]
- Petroleum refining and related industries (29)[6]
- Rubber products (30)
- Stone, clay, and glass products (32)
- Primary metals (33)
    - Ferrous metals and products (331-32, 3398-99)
    - Nonferrous metals and products (333-36)
- Fabricated metal products (34)
- Machinery (35)
    - Office, computing, and accounting machines (357)
    - Other machinery, except electrical (351-56, 358-59)
- Electrical equipment (36)[6]
    - Radio and TV receiving equipment (365)
    - Communication equipment (366)[6]
    - Electronic components (367)
    - Other electrical equipment (361-64, 369)

---

[2] For more detailed information on definitions, as well as the instructions for individual items covered in the survey questionnaire, see section C.

[3] For purposes of comparison, company-sponsored research and development by foreign affiliates of U.S. domestic companies performed outside the United States is reported in table B-7 but excluded from all other tables.

[4] Executive Office of the President, Office of Management and Budget, *Standard Industrial Classification Manual, 1972* (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office.) Industry group code numbers are shown in parentheses.

[5] The classification "Industrial Chemicals" was revised to include SIC Group 286, Industrial Organic Chemicals. All current and historical tables were revised accordingly.

[6] Starting with the 1978 survey, oil and gas extraction (13) was no longer grouped with petroleum refining (29), and communication (48) was no longer grouped with electrical equipment (36). Instead, these SIC groups are included in the nonmanufacturing sector so that the delineation between manufacturing and nonmanufacturing industries is more consistent. This change has had almost no effect on the levels of the data.

- Motor vehicles and motor vehicles equipment (371)
- Other transportation equipment (373-75, 379)
- Aircraft and missiles (372, 376)[7]
- Professional and scientific instruments (38)
  - Scientific and mechanical measuring instruments (381-82)
  - Optical, surgical, photographic, and other instruments (383-87)
- Other manufacturing industries—tobacco manufactures (21), printing and publishing (27), leather products (31), and miscellaneous manufacturing industries (39)
- Nonmanufacturing industries—agriculture, forestry, and fisheries (07-09); mining and extraction (10-14); contract construction (15-17); transportation, communication, and other public utilities (41-49); wholesale and retail trade (50-59); finance, insurance, and real estate (60-67); and selected service industries (739, 807, 891).

Company size-class—The size of a company as determined by the total number of its employees. The five company size-classes used in this report are: less than 1,000 employees; 1,000 to 4,999 employees; 5,000 to 9,999 employees; 10,000 to 24,999 employees; and 25,000 or more employees.

Classification of reporting units—The company or corporate family which includes all establishments under common ownership or control is the basic reporting unit. Each company was similarly classified into a single size-category on the basis of its total employment.

Cost per R&D scientist or engineer—The number of R&D scientists and engineers used to estimate the cost per R&D scientist or engineer for 1957-82 is the arithmetic mean of the numbers of R&D scientists and engineers reported in each industry for January in two consecutive years. This number is then divided into total R&D expenditures in each industry. For example, the mean of the numbers of R&D scientists and engineers in January 1982 and January 1983 is divided into total 1982 R&D expenditures for a total cost per scientist or engineer in 1982.

Nonavailability of certain statistics—Tables in section B use footnotes stating "not separately available but are included in total," indicating that statistics are withheld for not meeting publication standards for the following reasons: (1) Extremely high associated sampling error of estimate; (2) high rate of imputation (over 50 percent) because of failure of companies to supply data; (3) possible disclosure of data on an individual company; or, (4) data inconsistent for inclusion in a time series. In some instances, withheld data can be derived by subtraction from higher level totals. Where this is possible, the data user should be aware that the derived numbers are statistically unreliable. In *no* instance, however, can any data be derived which would disclose the operations of an individual company.

Questionable data—In cases where over 50 percent of the total has been estimated the data are not published. Users should consult table A-1 for imputation rates for specific items.

Method of computation—Detailed statistics in the tables may not add to totals or subtotals because of rounding. Also, percentages were calculated on the basis of thousands of dollars and may differ from those based on the rounded figures shown.

methodology of survey[8]

The sample used for the 1982 Survey of Industrial Research and Development represents all manufacturing industries and those nonmanufacturing industries known—on the basis of earlier, more detailed samples—to conduct or to finance research and development. The sampling unit for the survey was the company, defined as a business organization consisting of one or more establishments under common ownership or control. A new panel for the R&D survey is selected approximately every five years. The newest sample was selected for the 1981 survey (the first since the 1976 survey). Approximately 11,500 manufacturing and nonmanufacturing companies are included in the current sample, which consists of about 4,500 certainty companies (those with 100-percent chance of inclusion in the panel) and about 7,000 noncertainty companies.

The basic tool for the survey is form RD-1, which is used to collect detailed R&D information. Companies in the new panel that received an RD-1 form in the old panel once again received an RD-1 form in 1981 (about 1,200 companies). The remaining certainty (about 3,300) companies and noncertainty companies (about 7,000) in the new panel received RD-1A survey forms for 1981. Form RD-1A is an abbreviated version of RD-1 and is only mailed to companies in the year in which a new sample is drawn. The purpose of form RD-1A is to canvass smaller R&D performers with a minimum of reporting burden. Once the RD-1A forms were received and tabulated from the survey respondents in 1981, they were reviewed for total R&D expenditures. Those companies which reported R&D expenditures exceeding $1,000,000 on the RD-1A form were added to the survey panel consisting of those firms that receive the RD-1 form annually. There were about 575 such companies in 1981. The remaining RD-1A companies are not mailed another form but, in subsequent years, data for them are estimated by Census based upon their 1981 reports.

The universe frame from which the latest sample panel was selected was created from two sources—the 1981 Standard Statistical Establishment List (SSEL) for single units and the 1981 Enterprise Statistics Multiunits file.

There are about 3.5 to 4 million single-unit firms in the 1981 SSEL file (including nonmanufacturing firms). There are 5.6 million multiunit companies in the 1981 Enterprise file, of which 296,146 companies have identified themselves as engaged primarily in manufacturing. All manufacturing industries and selected nonmanufacturing industries (SIC's 49, 7391, 7392, 7399, and 8911) were considered within the scope of the survey.

Companies in these industries with 500 or more employees were included in the panel with certainty. For the companies with fewer than 500 employees, a measure of size was assigned to each company based on an estimate of its total R&D expenditures. Probabilities of selection were then assigned based on the measure of size. Finally, a sample selection process gave each company an independent chance of being included in the sample.

---

[7] Companies primarily engaged in the manufacture of ordnance and accessories, including complete guided missiles, are grouped with companies primarily engaged in the manufacture of aircraft and parts because of close similarity of R&D activities carried out by major companies in the two industries.

[8] This section was prepared in the Industry Division of the Bureau of the Census, the collecting and compiling agent for NSF in this survey.

Each year Census reviews the annual lists of R&D contractors published by the Department of Defense (DOD) and the National Aeronautics and Space Administration (NASA) to ensure that the large contractors are included in the sample. For the 1982 survey, the R&D-performing manufacturing companies from the largest DOD and NASA contractors were included in the reporting panel with certainty.

The particular sample selected is one of a large number of samples of the same type and size that, by chance, might have been selected. Estimates from each of the different samples would differ somewhat from each other, and from the results of a complete canvass conducted under essentially the same conditions as the survey. This variation among the possible estimates is defined by the sampling error, measured in standard error units. The complete canvass total would be included in the range—

1. From one standard error below to one standard error above the derived estimate for about two-thirds of all possible samples.
2. From two standard errors below to two standard errors above the derived estimate for about 95 percent of all possible samples.
3. From three standard errors below to three standard errors above the derived estimate, almost always.

An inference that the comparable complete canvass total would be within the indicated ranges would be correct in approximately the relative frequencies shown. Those proportions, therefore, may be interpreted as defining the confidence that the estimates from a particular sample would differ from complete coverage results by as much as one, two, or three standard errors, respectively.

For example, suppose an estimated total is shown as 400 with an associated relative standard error of 2 percent. Then, there is approximately 67-percent confidence that the interval 392 to 408 includes the complete canvass total, about 95-percent confidence that the interval 384 to 416 includes the complete canvass total, and almost certain confidence that the interval 376 to 424 includes the complete canvass total.

In addition to the sampling errors as measured by the standard error, the estimates are subject to errors in response, coding, processing, and imputation for nonresponse. These nonsampling errors would also occur if a complete canvass

Table A-1. Imputation rates for selected items on the research and development survey by industry: 1982

[Percent]

Industry	SIC code	Item 2		Item 4	Item 5 R&D Expenditures			Item 11		Item 13
					Total R&D					
		Sales[1]	Employment[1]	Scientists/engineers[1]	Total[1]	Company[1]	Federal[1]	Energy R&D	Pollution abatement	Foreign R&D
Total	....	6.4	4.6	25.8	3.7	3.7	1.5	27.7	53.1	8.9
Distribution by industry										
Food and kindred products	20	7.0	4.5	44.0	2.4	2.4	-	55.5	15.8	14.1
Textiles and apparel	22,23	8.9	9.6	25.1	10.9	10.9	-	4.8	56.8	-
Lumber, wood products, and furniture	24,25	7.0	23.2	48.2	2.7	2.7	-	-	-	-
Paper and allied products	26	.1	.1	15.1	2.6	2.6	-	.9	-	-
Chemicals and allied products	28	1.4	1.5	23.7	.8	.8	-	.7	.6	9.9
Industrial chemicals	281-82,286	2.0	2.2	13.4	.9	1.0	-	.3	.5	4.1
Drugs and medicines	283	.4	.5	36.4	.4	.4	-	3.9	7.0	15.1
Other chemicals	284-85,287-89	.6	1.0	13.8	1.4	1.4	-	14.2	-	1.0
Petroleum refining and related industries	29	3.5	1.7	42.8	1.4	1.4	1.6	31.4	14.4	46.6
Rubber products	30	.9	1.4	58.6	1.8	2.4	-	9.0	27.7	76.5
Stone, clay, and glass products	32	-	-	23.7	.8	1.0	-	-	-	-
Primary metals	33	1.8	1.4	18.2	1.5	2.0	-	1.1	-	1.9
Ferrous metals and products	331-32,3398-99	.3	.2	18.9	.4	.6	-	2.7	-	-
Nonferrous metals and products	333-36	5.8	5.3	17.1	4.0	4.2	-	.6	-	28.2
Fabricated metal products	34	23.0	21.5	44.6	14.3	14.8	5.4	2.1	1.0	23.4
Machinery	35	4.3	5.2	20.9	6.7	8.5	.5	11.9	29.4	1.3
Office, computing, and accounting machines	357	7.9	10.0	19.4	7.9	9.1	.5	-	-	-
Other machinery, except electrical	351-56,358-59	3.0	4.0	22.3	.4	.4	.4	13.7	29.5	6.6
Electrical equipment	36	2.7	2.9	26.8	2.4	3.5	.6	2.2	3.0	.7
Radio and TV receiving equipment	365	-	.6	12.7	.8	1.2	-	-	-	-
Communication equipment	366	4.0	3.8	13.6	1.5	2.4	1.2	-	-	.4
Electronic components	367	5.6	6.1	47.0	8.3	10.5	.3	36.1	85.4	3.9
Other electrical equipment	361-64,369	3.7	4.5	34.0	.8	.8	-	1.9	-	.2
Motor vehicles and motor vehicles equipment	371	3.5	4.0	6.7	3.0	2.4	10.0	96.9	94.1	.2
Other transportation equipment	373-75,379	1.3	3.5	16.3	2.9	4.5	-	17.9	76.3	-
Aircraft and missiles	372,376	1.2	.9	5.5	.6	.8	-	20.4	20.9	.3
Professional and scientific instruments	38	1.4	.9	59.5	1.9	1.0	.2	6.2	51.7	12.0
Scientific and mechanical measuring instruments	381-82	2.4	.7	60.4	.7	.8	.3	4.4	-	23.0
Optical, surgical, photographic, and other instruments	383-87	.8	1.0	57.9	.9	1.1	.1	64.0	58.0	7.2
Other manufacturing industries	21,27,31,39	1.5	18.1	40.7	1.4	1.5	-	9.3	47.5	16.8
Nonmanufacturing industries	07-17,41-67, 737,739,807,891	2.9	2.5	43.3	9.8	9.9	7.7	4.9	20.8	34.9

- Represents no imputation.

[1] These items calculated from Form RD-1 (detailed form mailed to large corporations conducting research and development) and from Form RD-1A (abbreviated version of RD-1 form mailed to smaller R&D performers). All other items calculated from Form RD-1 only; RD-1A respondents were not asked these questions.

were to be conducted under the same conditions as the survey (table A-2).

The forms for the survey were mailed in January 1983, and nonrespondents received followup letters by mail. Since total R&D performance funds, total Federal R&D funds, total net sales, and total employment are included in Census' mandatory statistical program the few companies that did not reply to form RD-1 for 1982 were mailed Census form MA-121, which collects these mandatory items.

In the absence of respondent-distributed data, Census has estimated data for items as required in accordance with past performance and industry averages. Table A-1 shows imputation rates for many survey items.

comparability of data over a period of several years

In the survey of industrial research and development, there is substantial comparability over any 2-year period. Before mailing the new survey forms each year, Census enters on each one the previous year's figures as reported by the respondent. The respondent is asked to adjust the data for the previous year as necessary to make it comparable to those data being reported for the current year. Such adjustments are made to reflect, for example, changes in reporting concepts or changes in company structure such as mergers or acquisitions. To maintain some measure of consistency, the employment-size classification of any company affected by such changes has been adjusted so that the company is tabulated in the same employment-size category for two consecutive years.

Some measure of the degree of change reflecting these adjustments in contrast to an actual change in R&D activity can be gained by comparing figures for the same year reported for two succeeding reporting periods, e.g., 1981 R&D statistics in the final report of the 1981 survey and the revised 1981 R&D statistics in the final report of the 1982 survey. The totals for broad classifications are likely to be very close in the two reports; larger differences

Table A-2. Standard error of estimate (percentage) of funds for R&D performance for all company size-groups and for companies with less than 1,000 employees by industry: 1982

Industry	SIC code	Standard error[1]	Standard error of companies with less than 1,000 employees
Total	....	(2)	10
Food and kindred products	20	1	21
Textiles and apparel	22,23	3	22
Lumber, wood products, and furniture	24,25	2	23
Paper and allied products	26	1	36
Chemicals and allied products	28	1	9
Industrial chemicals	281-82,286	(2)	16
Drugs and medicines	283	3	15
Other chemicals	284-85,287-89	2	14
Petroleum refining and related industries	29	(2)	6
Rubber products	30	3	32
Stone, clay, and glass products	32	1	23
Primary metals	33	1	22
Ferrous metals and products	331-32,3398-99	(2)	15
Nonferrous metals and products	333-36	4	26
Fabricated metal products	34	2	18
Machinery	35	1	11
Office, computing, and accounting machines	357	(2)	15
Other machinery, except electrical	351-56,358-59	2	10
Electrical equipment	36	1	17
Radio and TV receiving equipment	365	1	20
Communication equipment	366	1	19
Electronic components	367	(2)	17
Other electrical equipment	361-64,369	2	41
Motor vehicles and motor vehicles equipment	371	(2)	14
Other transportation equipment	373-75,379	1	9
Aircraft and missiles	372,376	1	91
Professional and scientific instruments	38	2	20
Scientific and mechanical measuring instruments	381-82	4	32
Optical, surgical, photographic, and other instruments	383-87	(2)	8
Other manufacturing industries	21,27,31,39	1	13
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	7	27

[1] A description of the standard error of estimate is given in section A under "Methodology of Survey." The percentage (or relative) standard errors in this table may be converted to standard errors of estimate by multiplying the percentage shown by the associated estimate. For example, the relative standard error of estimate for R&D performance for all company size groups in the paper and allied products industry (SIC 26) is shown as 1 percent, and the associated total R&D estimate for this industry is shown as $626 million in table B-2, "Funds for research and development by industry and size of company: 1982." The standard error of estimate, then, is .01 times 626 or 6.26.

[2] Less than 0.5 percent.

are noticeable in the finer detail. The results underscore the point that the measures are approximate and indicative rather than precise.

industry codes for 1967-82[9]

The industry codes appearing in the tables are based on the 1972 Standard Industrial Classification (SIC) Manual. The SIC code for individual companies for 1967-74 (which were utilized in the publications for those years) were originally determined by data reported in the 1967 Economic Censuses. The SIC codes for individual companies for 1977-79 (which were utilized in the publications for those years) were originally determined by the 1974 SSEL file. Between 1967 and 1974 and again between 1977 and 1979, the SIC code for a company on the R&D survey generally remained fixed and reflected that company's principal activity as of 1967 or 1976. Under certain circumstances, however, such as the merger of two or more companies, the acquisition of one company by another, or the formation of "conglomerates," the 1967 or 1976 SIC code for a company could have changed. Census could not be aware of a possible new SIC code for a company until the 1976 or 1981 new sample was drawn based upon the 1974 or 1981 SSEL file. (See above description of the new sample.) When the new sample was selected in each of the years 1976 and 1981, the industry codes of companies in both the old and new panels were examined for possible change. The historical R&D tables (e.g., 1968-74 and 1977-79) have been adjusted to reflect the change in company activities. As it is not known normally when a company changed its industrial activities, the data were adjusted in the following fashion: for companies changing industry codes between 1967 and 1974, the industry total for each of the years affected (1968 through 1974) were estimated to have changed at a constant rate of 14.3 percent per year. Accordingly, the data for the industry in which such a company had been classified in 1967 were deflated by 14.3 percent per year for each of the years 1968-74 (e.g., 14.3 percent subtracted in 1968, 28.6 percent in 1977, 42.9 in 1970, etc.). Similarly, the data for the industry in which such a company was classified in 1974 were inflated by 14.3 percent per year for each of the years 1968-74.

To reflect changes in industry classification between 1976 and 1981, a nonlinear algorithm was used which is intended to link the two sample years while preserving the original year-to-year industry trends as much as possible. Estimates for 1976 remained unchanged since they were based on accurate classifications of companies at that time. Revised estimates for 1980 were formed based upon prior-period data that were collected in the new 1981 sample. Thus, the revised estimates reflect the most recent classification. Based on the 1976 estimates and the revised 1980 estimates, data for each industry grouping for the years 1977, 1978, and 1979 were revised.

The following measures were adjusted in the manner just described: Number of scientists and engineers; funds for research and development—total, Federal, and company; net sales; cost per R&D scientist or engineer; and basic research expenditures. Historical data for the other categories appear in selected tables of this publication. (See tables B-2, B-5, B-7, B-9, B-18, B-19, B-24, B-25, B-26, B-30, B-34, B-35, and B-39.) No adjustments were made in data for other measures.

---

[9] For a discussion of industry codes for 1966 and earlier years, see National Science Foundation, *Research and Development in Industry, 1975: Funds, 1975; Scientists & Engineers, January 1976* (NSF 77-324), and *Research and Development in Industry, 1970: Funds, 1970; Scientists & Engineers, January 1971* (NSF 72-309) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1978 and 1972).

section b

statistical tables

In all tables of this report

- Details may not add to totals because of rounding.
- Percentages were calculated on the basis of thousands of dollars and may differ from those based on the rounded figures shown.
- Percentage changes are increases unless otherwise indicated.

page

Total Funds for Research and Development

B-1. Trends in funds for industrial research and development by source: 1956-82 9
B-2. Funds for research and development by industry and size of company: 1956, 1958, 1963, 1967, and 1971-82 10
B-3. Funds for research and development by industry and size of company: 1982 11
B-4. Funds for research and development by industry, size of company, and size of R&D program: 1982 12

Company Funds for Research and Development

B-5. Company funds for research and development by industry and size of company: 1957-58, 1963, 1967, and 1971-82 .. 13
page
B-6. Company funds for research and development by industry and size of company: 1982 ... 14
B-7. Company-financed research and development performed by foreign affiliates of U.S. domestic companies outside the United States by selected industry: 1974-82 15
B-8. Company funds for R&D performance by selected industry: 1982 actual and 1983 projected 15

Federal Funds for Research and Development

B-9. Federal funds for research and development by industry and size of company: 1957-58, 1963, 1967, and 1971-82 16
B-10. Federal funds for research and development by industry and size of company: 1982 17
B-11. R&D-performing companies with 1,000 or more employees and number with Federal R&D funds by industry and size of company: 1982 18
B-12. Industry-administered federally funded research and development centers—composition of work force and funds by character of work: 1981-82 19

R&D Funds by Size of Company

B-13. R&D-performing companies in manufacturing and nonmanufacturing industries by size of company: 1982 19
page
B-14. R&D-performing companies with 1,000 or more employees by size of company and R&D program: 1982 19
B-15. R&D-performing manufacturing companies with 5,000 or more employees by industry and percent change in R&D funds: 1981-82 20
B-16. Percent of total, Federal, and company funds of R&D-performing companies ranked by size of R&D program: 1972-82 21

R&D Funds Related to Net Sales

B-17. Net sales of R&D-performing companies by industry and size of company: 1981-82 22
B-18. R&D funds as a percent of net sales in R&D-performing manufacturing companies by industry and size of company: 1957-58, 1963, 1967, and 1971-82 23
B-19. Company R&D funds as a percent of net sales in R&D-performing manufacturing companies by industry and size of company: 1957-58, 1963, 1967, and 1971-82 24
B-20. R&D funds as a percent of net sales in R&D-performing manufacturing companies ranked by size of R&D program by industry: 1982 25

SOME DATA MAY HAVE SIGNIFICANT IMPUTATION RATES. SEE TECHNICAL NOTES FOR DETAILS.

page

B-21. Company R&D funds as a percent of net sales in R&D-performing manufacturing companies ranked by size of net sales by industry: 1982 ... 26
B-22. Percent of net sales and employment of R&D-performing companies ranked by size of R&D program: 1972-82 26
B-23. Percent of total and Federal R&D funds and of net sales of R&D-performing companies ranked by size of R&D program by industry: 1982 27

Energy and Pollution Abatement Research and Development

B-24. Expenditures for energy research and development by selected industry: 1972-83 (projected) 28
B-25. Company funds for energy research and development by selected industry: 1973-82 ... 28
B-26. Federal funds for energy research and development by selected industry: 1973-82 ... 29

page

B-27. Industrial expenditures for energy research and development by primary energy source: 1972-83 (projected) .. 29
B-28. Company funds for energy research and development by primary energy source: 1972-82 30
B-29. Federal funds for energy research and development by primary energy source: 1972-82 30
B-30. Expenditures for pollution abatement research and development by industry: 1973-83 (projected) 31
B-31. Expenditures for pollution abatement research and development by industry and source of funds: 1981-82 32
B-32. Industrial expenditures for pollution abatement research and development by type of pollution and source of funds: 1981-82 33
B-33. Industrial expenditures for pollution abatement research and development by type of pollution: 1973-83 (projected) 33

page

Employment

B-34. Full-time-equivalent number of R&D scientists and engineers by industry and size of company: 1957-58, 1963-64, 1967-68, and 1972-83 34
B-35. Cost per R&D scientist or engineer by industry and size of company: 1957-58, 1963, 1967, and 1971-82 35
B-36. Cost per R&D scientist or engineer by industry and size of company: 1982 36
B-37. Cost per R&D scientist or engineer in companies ranked by size of R&D program: 1972-82 36
B-38. Total employment of R&D-performing companies by industry and size of company: 1981-82 37
B-39. R&D scientists and engineers per 1,000 employees by industry and size of company: 1958, 1963, 1967, and 1971-82 38
B-40. Total and company R&D funds per employee by size of company: 1963 and 1967-82 . 39

Table B-1. Trends in funds for industrial research and development by source: 1956-82

[Dollars in millions]

Year	Total R&D		Federal		Company[1]	
	Amount	Percent change from previous year	Amount	Percent of total	Amount	Percent of total
1956	$6,605	42	$3,328	50	$3,277	50
1957	7,731	17	4,335	56	3,396	44
1958	8,389	9	4,759	57	3,620	43
1959	9,618	15	5,635	59	3,983	41
1960	10,509	9	6,081	58	4,428	42
1961[2]	10,908	4	6,240	57	4,668	43
1962	11,464	5	6,434	56	5,029	44
1963	12,630	10	7,270	58	5,360	42
1964	13,512	7	7,720	57	5,792	43
1965	14,185	5	7,740	55	6,445	45
1966	15,548	10	8,332	54	7,216	46
1967	16,385	5	8,365	51	8,020	49
1968	17,429	6	8,560	49	8,869	51
1969	18,308	5	8,451	46	9,857	54
1970	18,067	-1	7,779	43	10,288	57
1971	18,320	1	7,666	42	10,654	58
1972	19,552	7	8,017	41	11,535	59
1973	21,249	9	8,145	38	13,104	62
1974	22,887	8	8,220	36	14,667	64
1975	24,187	6	8,605	36	15,582	64
1976	26,997	12	9,561	35	17,436	65
1977	29,825	10	10,485	35	19,340	65
1978	33,304	12	11,189	34	22,115	66
1979	38,226	15	12,518	33	25,708	67
1980	44,505	16	14,029	32	30,476	68
1981	51,810	16	16,382	32	35,428	68
1982	58,960	14	19,059	32	39,901	68

[1] Company funds include all funds for industrial R&D work performed within company facilities except funds provided by the Federal Government. Excluded are company-financed research and development contracted to outside organizations such as research institutions, universities and colleges, or other nonprofit organizations.

[2] Funds by source estimated by the National Science Foundation.

SOURCE: National Science Foundation.

Table B-2. Funds for research and development by industry and size of company: 1956, 1958, 1963, 1967, and 1971-82

[Dollars in millions]

Industry and size of company	SIC code	1956	1958	1963	1967	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Total	....	$6,605	$8,389	$12,630	$16,385	$18,320	$19,552	$21,249	$22,887	$24,187	$26,997	$29,825	$33,304	$38,226	$44,505	$51,810	$58,960
Distribution by industry																	
Food and kindred products	20	64	83	130	183	246	259	269	298	335	355	415	472	528	620	(1)	(1)
Textiles and apparel	22,23	(1)	26	30	57	59	61	64	69	70	82	83	89	101	115	(1)	(1)
Lumber, wood products, and furniture	24,25	(1)	12	11	12	53	64	71	84	88	107	123	126	139	148	161	159
Paper and allied products	26	36	42	69	128	187	189	194	237	249	313	333	387	445	495	(1)	626
Chemicals and allied products	28	641	792	1,239	1,507	1,832	1,932	2,116	2,550	2,727	3,017	3,202	3,580	4,038	4,636	5,625	6,588
Industrial chemicals	281-82,286	460	553	809	966	1,009	1,031	1,119	1,299	1,391	1,524	1,668	1,798	1,962	2,197	2,802	3,191
Drugs and medicines	283	94	126	216	343	549	607	698	807	981	1,091	1,117	1,308	1,517	1,777	(1)	(1)
Other chemicals	284-85,287-89	87	111	214	198	274	294	299	344	354	401	417	474	559	662	(1)	(1)
Petroleum refining and related industries	29	182	246	317	371	505	468	498	622	693	767	918	1,060	1,262	1,552	(1)	(1)
Rubber products	30	(1)	[2]89	156	182	289	377	426	469	467	502	491	493	577	656	(1)	(1)
Stone, clay, and glass products	32	[2]60	[2]75	100	136	164	183	199	217	233	263	287	324	356	406	(1)	(1)
Primary metals	33	90	131	183	242	272	277	307	358	443	506	538	560	634	728	878	1,005
Ferrous metals and products[3]	331-32,3398-99	(1)	80	106	135	144	146	163	181	215	256	284	314	375	443	(1)	(1)
Nonferrous metals and products[3]	333-36	(1)	51	77	107	128	130	145	177	228	250	254	246	259	285	(1)	(1)
Fabricated metal products	34	116	162	153	163	242	253	291	313	324	358	386	384	455	550	624	570
Machinery	35	543	781	958	1,326	1,860	2,158	2,549	2,985	3,196	3,487	3,880	4,283	4,825	5,901	6,818	7,879
Office, computing, and accounting machines	357	(4)	(4)	(4)	(4)	(4)	1,456	1,733	2,103	2,220	2,402	2,655	2,883	3,214	3,962	(1)	(1)
Other machinery, except electrical	351-56,358-59	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	1,225	1,400	1,611	1,939	(1)	(1)
Electrical equipment	36	1,516	1,969	2,868	3,867	4,389	4,680	4,902	5,011	5,105	5,636	5,886	6,507	7,824	9,175	10,329	11,925
Radio and TV receiving equipment	365	(6)	(6)	(6)	45	64	48	49	51	50	52	96	130	245	556	(1)	(1)
Communication equipment	366	(1)	868	1,773	2,425	2,731	2,583	2,613	2,424	2,385	2,511	2,725	2,999	3,635	4,024	4,758	5,775
Electronic components	367						330	406	489	549	691	770	902	1,169	1,547	1,573	1,803
Other electrical equipment	361-64,369	(1)	1,101	1,093	1,397	1,594	1,719	1,834	2,047	2,121	2,382	2,295	2,476	2,775	3,048	(1)	(1)
Motor vehicles and motor vehicles equipment	371	688	856	1,090	1,354	1,768	1,954	2,405	2,389	2,340	2,778	3,358	3,879	4,509	4,955	4,806	4,962
Other transportation equipment	373-75,379						56	72	87	90	94	120	131	159	162	(1)	(1)
Aircraft and missiles	372,376	2,138	2,609	4,712	5,669	4,881	4,950	5,052	5,278	5,713	6,339	7,033	7,536	8,041	9,198	11,968	14,045
Professional and scientific instruments	38	200	294	284	542	746	838	961	1,075	1,173	1,331	1,571	1,998	2,505	3,029	3,614	4,047
Scientific and mechanical measuring instruments	381-82	97	156	70	104	133	163	186	221	266	325	452	670	950	1,352	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	103	138	214	438	612	675	775	854	907	1,007	1,119	1,328	1,555	1,677	(1)	(1)
Other manufacturing industries	21,27,31,39	(1)	105	54	90	131	146	158	177	205	217	243	266	288	364	(1)	(1)
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	(1)	117	276	559	704	707	715	768	735	845	958	1,229	1,540	1,815	1,906	2,168
Distribution by size of company (based on number of employees)																	
Less than 1,000	....	369	532	619	687	884	929	940	1,058	1,222	1,384	1,353	1,438	1,764	2,065	2,305	2,485
1,000 to 4,999	....	[2]550	642	1,022	1,017	1,195	1,215	1,248	1,370	1,385	1,500	1,526	1,931	2,483	2,701	3,148	3,483
5,000 to 9,999	....	[2]5,686	7,215	10,989	892	1,170	1,076	1,168	1,346	1,478	1,648	1,829	1,551	1,691	2,028	2,988	3,331
10,000 to 24,999	....				13,790	15,071	2,159	2,236	2,416	2,633	2,874	3,418	4,278	5,191	6,017	6,762	7,959
25,000 or more	....						14,173	15,657	16,697	17,469	19,591	21,699	24,106	27,097	31,693	36,607	41,701

[1] Not separately available but included in total. See general notes.
[2] Estimated by the National Science Foundation.
[3] SIC codes 3398 and 3399 included in the nonferrous metals and products group for 1956-63.
[4] Data not tabulated at this level prior to 1972.
[5] Data not tabulated at this level prior to 1977.
[6] Included in the other electrical equipment group.

SOURCE: National Science Foundation.

Table B-3. Funds for research and development by industry and size of company: 1982

[Dollars in millions]

Industry	SIC code	Total	Companies with total employment of--				
			Less than 1,000	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Total	....	$58,960	$2,485	$3,483	$3,331	$7,959	$41,701
Food and kindred products	20	(1)	(1)	73	(1)	(1)	298
Textiles and apparel	22,23	(1)	(1)	(1)	(1)	34	25
Lumber, wood products, and furniture	24,25	159	(1)	32	26	(1)	(1)
Paper and allied products	26	626	18	55	31	(1)	(1)
Chemicals and allied products	28	6,588	(1)	(1)	(1)	(1)	2,737
Industrial chemicals	281-82,286	3,191	(1)	(1)	(1)	(1)	(1)
Drugs and medicines	283	(1)	(1)	(1)	424	(1)	323
Other chemicals	284-85,287-89	(1)	(1)	210	88	(1)	(1)
Petroleum refining and related industries	29	(1)	(1)	19	(1)	(1)	(1)
Rubber products	30	(1)	(1)	(1)	(1)	(1)	(1)
Stone, clay, and glass products	32	(1)	22	31	(1)	(1)	(1)
Primary metals	33	1,005	(1)	89	(1)	(1)	(1)
Ferrous metals and products	331-32,3398-99	(1)	9	(1)	(1)	(1)	(1)
Nonferrous metals and products	333-36	(1)	(1)	(1)	57	32	(1)
Fabricated metal products	34	570	67	115	(1)	(1)	(1)
Machinery	35	7,879	(1)	653	(1)	899	5,518
Office, computing, and accounting machines	357	(1)	(1)	(1)	(1)	(1)	(1)
Other machinery, except electrical	351-56,358-59	(1)	(1)	(1)	214	(1)	(1)
Electrical equipment	36	11,925	387	515	585	1,328	9,110
Radio and TV receiving equipment	365	(1)	(1)	17	0	85	(1)
Communication equipment	366	5,775	(1)	195	(1)	655	4,622
Electronic components	367	1,803	(1)	(1)	(1)	(1)	(1)
Other electrical equipment	361-64,369	(1)	(1)	(1)	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371	4,962	(1)	23	(1)	(1)	4,660
Other transportation equipment	373-75,379	(1)	(1)	15	(1)	(1)	70
Aircraft and missiles	372,376	14,045	(1)	140	(1)	962	12,517
Professional and scientific instruments	38	4,047	(1)	302	347	(1)	2,625
Scientific and mechanical measuring instruments	381-82	(1)	(1)	(1)	(1)	(1)	1,089
Optical, surgical, photographic, and other instruments	383-87	(1)	(1)	(1)	(1)	(1)	1,537
Other manufacturing industries	21,27,31,39	(1)	38	99	72	(1)	(1)
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	2,168	525	532	(1)	405	(1)

[1] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

AVAILABLE

Table B-4. Funds for research and development by industry, size of company, and size of R&D progam: 1982

Industry and size of company	SIC code	Total	R&D size of program [thousands of dollars]				
			Less than $200	$200 to $999	$1,000 to $9,999	$10,000 to $99,999	$100,000 or more
Total	....	$58,960	$480	$737	$3,305	$10,662	$43,775
Food and kindred products	20	(1)	(1)	29	186	521	0
Textiles and apparel	22,23	(1)	(1)	15	67	32	0
Lumber, wood products, and furniture	24,25	159	9	13	54	84	0
Paper and allied products	26	626	2	16	(1)	245	(1)
Chemicals and allied products	28	6,588	43	62	269	1,967	4,247
Industrial chemicals	281-82,286	3,191	6	26	91	791	2,276
Drugs and medicines	283	(1)	(1)	13	(1)	866	(1)
Other chemicals	284-85,287-89	(1)	(1)	23	(1)	310	(1)
Petroleum refining and related industries	29	(1)	(1)	2	17	298	1,775
Rubber products	30	(1)	(1)	(1)	(1)	(1)	(1)
Stone, clay, and glass products	32	(1)	(1)	17	51	417	0
Primary metals	33	1,005	7	17	173	531	278
Ferrous metals and products	331-32,3398-99	(1)	(1)	14	82	320	278
Nonferrous metals and products	333-36	(1)	(1)	3	91	211	0
Fabricated metal products	34	570	26	36	150	358	0
Machinery	35	7,879	104	184	638	1,361	5,592
Office, computing, and accounting machines	357	(1)	(1)	42	191	651	4,529
Other machinery, except electrical	351-56,358-59	(1)	(1)	142	447	711	1,063
Electrical equipment	36	11,925	52	116	484	1,737	9,536
Radio and TV receiving equipment	365	(1)	(1)	15	(1)	(1)	(1)
Communication equipment	366	5,775	13	28	102	424	5,208
Electronic components	367	1,803	17	29	138	718	901
Other electrical equipment	361-64,369	(1)	(1)	44	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371	4,962	5	13	29	225	4,691
Other transportation equipment	373-75,379	(1)	(1)	(1)	37	(1)	0
Aircraft and missiles	372,376	14,045	2	11	193	418	13,422
Professional and scientific instruments	38	4,047	25	80	360	492	3,090
Scientific and mechanical measuring instruments	381-82	(1)	(1)	43	(1)	337	(1)
Optical, surgical, photographic, and other instruments	383-87	(1)	(1)	37	(1)	155	(1)
Other manufacturing industries	21,27,31,39	(1)	(1)	21	117	351	0
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	2,168	104	73	331	1,248	414
Distribution by size of company (based on number of employees)							
Less than 1,000	....	2,485	467	594	1,128	296	0
1,000 to 4,999	....	3,483	(1)	(1)	1,336	2,018	0
5,000 to 9,999	....	3,331	(1)	(1)	502	2,126	688
10,000 to 24,999	....	7,959	0	(1)	(1)	3,856	3,808
25,000 or more	....	41,701	0	(1)	(1)	2,366	39,279

[1] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

Table B-5. Company funds for research and development by industry and size of company: 1957-58, 1963, 1967, and 1971-82

[Dollars in millions]

Industry and size of company	SIC code	1957	1958	1963	1967	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Total	....	$3,396	$3,630	$5,360	$8,020	$10,654	$11,535	$13,104	$14,667	$15,582	$17,436	$19,340	$22,115	$25,708	$30,476	$35,428	$39,901
Distribution by industry																	
Food and kindred products	20	74	77	(1)	181	238	258	266	297	(1)	(1)	(1)	(1)	(1)	(1)	636	745
Textiles and apparel	22,23	14	20	(1)	(1)	59	61	63	(1)	(1)	(1)	(1)	(1)	(1)	(1)	116	125
Lumber, wood products, and furniture	24,25	14	12	(1)	12	(1)	(1)	(1)	(1)	88	106	123	126	139	148	161	159
Paper and allied products	26	35	42	69	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	495	566	626
Chemicals and allied products	28	616	666	1,004	1,297	1,648	1,741	1,913	2,236	2,490	2,751	2,907	3,250	3,692	4,264	5,205	6,155
Industrial chemicals	281-82,286	423	443	662	785	850	860	936	1,105	1,173	1,275	1,387	1,473	1,617	1,856	2,393	2,769
Drugs and medicines	283	104	126	207	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	1,756	2,064	2,531
Other chemicals	284-85,287-89	89	97	135	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	653	747	855
Petroleum refining and related industries	29	200	234	296	355	488	454	485	603	(1)	715	842	939	1,109	1,401	1,780	2,002
Rubber products	30	70	68	111	160	221	255	280	(1)	(1)	(1)	(1)	(1)	(1)	(1)	598	671
Stone, clay, and glass products	32	(1)	(1)	97	134	153	168	184	203	(1)	(1)	(1)	(1)	(1)	363	411	418
Primary metals	33	103	117	174	234	266	264	297	350	422	481	494	497	539	594	702	727
Ferrous metals and products[2]	331-32,3398-99	63	78	105	134	142	144	159	(1)	211	252	261	271	305	338	415	446
Nonferrous metals and products[2]	333-36	40	39	69	100	124	121	138	(1)	211	229	233	226	234	256	287	281
Fabricated metal products	34	97	105	129	151	230	243	279	299	297	322	342	348	414	501	545	512
Machinery	35	397	438	709	1,004	1,545	1,758	2,120	2,473	2,687	2,955	3,403	3,901	4,490	5,254	6,124	7,020
Office, computing, and accounting machines	357	(3)	(3)	(3)	(3)	(3)	(1)	(1)	(1)	1,734	1,893	2,220	2,556	2,958	3,436	3,847	4,717
Other machinery, except electrical	351-56,358-59	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	1,183	1,345	1,532	1,818	2,277	2,303
Electrical equipment	36	608	632	1,017	1,571	2,131	2,313	2,491	2,704	2,798	3,081	3,238	3,741	4,515	5,431	6,409	7,336
Radio and TV receiving equipment	365	(5)	(5)	(5)	(1)	(1)	(1)	(1)	(1)	(1)	52	85	102	192	346	358	397
Communication equipment	366	230	253	564	930	1,252	1,165	1,251	1,287	1,328	1,418	1,559	1,763	2,049	2,367	2,975	3,594
Electronic components	367						205	260	306	(1)	(1)	(1)	(1)	(1)	1,165	1,212	1,411
Other electrical equipment	361-64,369	378	379	453	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	1,553	1,864	1,933
Motor vehicles and motor vehicles equipment	371	517	560	799	994	1,461	1,661	2,020	2,101	2,022	2,395	2,887	3,381	3,780	4,300	4,219	4,361
Other transportation equipment	373-75,379						29	33	40	43	(1)	(1)	(1)	(1)	88	80	90
Aircraft and missiles	372,376	299	333	452	1,138	1,017	978	1,154	1,278	1,285	1,418	1,547	1,823	2,201	2,570	3,440	3,895
Professional and scientific instruments	38	140	157	202	353	583	678	801	908	1,001	1,168	1,350	1,668	2,012	2,456	2,978	3,401
Scientific and mechanical measuring instruments	381-82	59	63	53	67	120	151	175	211	251	309	405	560	747	1,001	1,235	1,429
Optical, surgical, photographic, and other instruments	383-87	81	94	149	286	463	527	626	697	750	859	945	1,108	1,265	1,454	1,743	1,972
Other manufacturing industries	21,27,31,39	19	33	52	88	(1)	(1)	(1)	(1)	198	212	204	266	288	339	411	478
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	(1)	55	85	172	252	277	299	305	425	471	541	702	859	1,037	1,048	1,180
Distribution by size of company (based on number of employees)																	
Less than 1,000	....	375	299	425	459	565	603	633	691	949	1,085	1,145	1,226	1,375	1,711	1,880	1,960
1,000 to 4,999	....	[6]406	[6]440	596	666	828	843	891	992	1,132	1,231	1,289	1,586	1,893	2,257	2,586	2,838
5,000 to 9,999	....	[6]2,615	[6]2,891	4,338	642	956	890	981	1,116	1,190	1,334	1,439	1,310	1,463	1,596	2,369	2,666
10,000 to 24,999	....				6,254	8,305	1,540	1,731	1,986	2,262	2,325	2,583	3,203	4,012	4,867	5,537	6,514
25,000 or more	....						7,659	8,868	9,882	10,049	11,461	12,884	14,790	16,965	20,045	23,056	25,922

Note: Company funds include all funds for industrial R&D work performed within company facilities except funds provided by the Federal Government. Excluded are company-financed research and development contracted to outside organizations such as research institutions, universities and colleges, or other nonprofit organizations.

[1] Not separately available but included in total. See general notes.
[2] SIC codes 3398 and 3399 included in the nonferrous metals and products group for 1957-63.
[3] Data not tabulated at this level prior to 1972.
[4] Data not tabulated at this level prior to 1977.
[5] Included in the other electrical equipment group.
[6] Estimated by the National Science Foundation.

SOURCE: National Science Foundation.

Table B-6. Company funds for research and development by industry and size of company: 1982

[Dollars in millions]

Industry	SIC code	Companies with total employment of--					
		Total	Less than 1,000	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Total	....	$39,901	$1,960	$2,838	$2,666	$6,514	$25,922
Food and kindred products	20	745	24	73	116	235	298
Textiles and apparel	22,23	125	18	22	25	34	25
Lumber, wood products, and furniture	24,25	159	(1)	32	26	(1)	(1)
Paper and allied products	26	626	18	55	31	(1)	(1)
Chemicals and allied products	28	6,155	208	656	841	2,110	2,340
Industrial chemicals	281-82,286	2,769	68	137	329	455	1,779
Drugs and medicines	283	2,531	(1)	310	424	1,442	(1)
Other chemicals	284-85,287-89	855	(1)	210	88	212	(1)
Petroleum refining and related industries	29	2,002	(1)	19	(1)	279	1,680
Rubber products	30	671	79	100	50	119	323
Stone, clay, and glass products	32	418	22	31	(1)	238	(1)
Primary metals	33	727	36	86	99	69	436
Ferrous metals and products	331-32,3398-99	446	9	53	42	37	304
Nonferrous metals and products	333-36	281	27	33	57	32	132
Fabricated metal products	34	512	67	95	105	71	173
Machinery	35	7,020	482	626	311	891	4,710
Office, computing, and accounting machines	357	4,717	(1)	318	(1)	318	3,830
Other machinery, except electrical	351-56,358-59	2,303	(1)	308	(1)	573	880
Electrical equipment	36	7,336	360	384	430	923	5,239
Radio and TV receiving equipment	365	397	(1)	17	0	85	(1)
Communication equipment	366	3,594	88	84	94	257	3,071
Electronic components	367	1,411	101	110	272	335	593
Other electrical equipment	361-64,369	1,933	(1)	173	64	246	(1)
Motor vehicles and motor vehicles equipment	371	4,361	(1)	23	41	(1)	4,152
Other transportation equipment	373-75,379	90	9	15	(1)	(1)	(1)
Aircraft and missiles	372,376	3,895	13	45	55	473	3,308
Professional and scientific instruments	38	3,401	316	259	212	416	2,198
Scientific and mechanical measuring instruments	381-82	1,429	184	181	69	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	1,972	131	78	143	(1)	(1)
Other manufacturing industries	21,27,31,39	478	37	99	72	117	153
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	1,180	236	217	222	175	329

[1] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

Table B-7. Company-financed research and development performed by foreign affiliates of U.S. domestic companies outside the United States by selected industry: 1974-82

[Dollars in millions]

Industry	SIC code	1974[1]	1975	1976	1977	1978	1979	1980	1981	1982
Total	....	$1,300	$1,454	$1,659	$1,877	$2,209	$2,754	$3,165	$3,393	$3,113
Food and kindred products	20	27	23	29	32	43	51	54	62	65
Chemicals and allied products	28	208	269	312	332	395	500	603	715	713
Industrial and other chemicals	281-82,284-89	82	85	108	133	151	199	245	287	313
Drugs and medicines	283	126	184	204	199	244	301	357	428	400
Petroleum refining and related industries	29	(2)	(2)	(2)	(2)	(2)	(2)	141	194	135
Stone, clay, and glass products	32	7	7	(2)	(2)	(2)	(3)	21	18	7
Primary metals	33	3	9	12	9	9	11	11	9	10
Fabricated metal products	34	(2)	(2)	22	24	29	(3)	(3)	30	28
Machinery	35	258	331	352	411	460	534	599	612	469
Electrical equipment	36	238	245	278	300	352	445	451	475	449
Electronic components	367	4	7	9	13	17	25	29	40	38
Other electrical equipment	361-64,369	(3)	(3)	6	5	9	11	11	39	36
Radio and TV receiving equipment; communication equipment	365-66	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Transportation	37	406	412	464	558	640	874	1,020	884	840
Motor vehicles and other transportation equipment	371,373-75,379	364	373	423	514	(3)	(3)	(3)	(3)	(3)
Aircraft and missiles	372,376	42	39	41	44	(3)	(3)	(3)	(3)	(3)
Professional and scientific instruments	38	39	49	69	91	121	156	186	230	237
Other manufacturing industries	21-27,30-31,39	111	105	137	144	181	213	139	156	150
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	3	4	4	9	12	5	7	8	10

Note: Data are reported in current U.S. dollars.

[1] Based on data obtained from the top 200 U.S. R&D performing companies.
[2] Included in the other manufacturing industries group.
[3] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

Table B-8. Company funds for R&D performance by selected industry: 1982 actual and 1983 projected

[Dollars in millions]

Industry	SIC code	Actual 1982	1983 (projected)
Total	....	$39,901	$41,967
Chemicals and allied products	28	6,155	6,391
Industrial chemicals	281-82,286	2,769	2,971
Machinery	35	7,020	7,813
Electrical equipment	36	7,336	7,715
Communication equipment	366	3,594	3,717
Motor vehicles and motor vehicles equipment	371	4,361	(1)
Aircraft and missiles	372,376	3,895	3,839
All other industries	....	11,134	11,716

[1] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation

AVAILABLE

Table B-9. Federal funds for research and development by industry and size of company: 1957-58, 1963, 1967, and 1971-82

[Dollars in millions]

Industry and size of company	SIC code	1957	1958	1963	1967	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Total	....	$4,335	$4,759	$7,270	$8,365	$7,666	$8,017	$8,145	$8,220	$8,605	$9,561	$10,485	$11,189	$12,518	$14,029	$16,382	$19,059
Distribution by industry																	
Food and kindred products	20	(1)	6	(2)	2	2	1	1	1	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Textiles and apparel[3]	22,23	(3)	(3)	(2)	(2)	1	1	1	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Lumber, wood products, and furniture[3]	24,25	(3)	(3)	(2)	0	(2)	(2)	(2)	(2)	0	0	0	0	0	(2)	0	0
Paper and allied products	26	(1)	0	0	(2)	(2)	2	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	0
Chemicals and allied products	28	89	126	234	210	184	189	203	214	236	266	295	330	346	372	421	433
Industrial chemicals	281-82,286	80	110	146	181	159	171	183	194	218	249	281	325	345	341	409	422
Drugs and medicines	283	(1)	2	9	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Other chemicals	284-85,287-89	9	14	79	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Petroleum refining and related industries	29	11	12	21	16	17	15	14	20	(2)	52	76	121	153	151	(2)	(2)
Rubber products	30	37	21	46	22	69	123	146	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Stone, clay, and glass products	32	(2)	(2)	3	2	10	14	15	14	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Primary metals	33	5	14	10	8	6	12	11	8	21	26	44	63	95	135	176	279
Ferrous metals and products[4]	331-32,3398-99	1	2	2	1	2	3	4	(2)	3	4	23	43	70	105	(2)	(2)
Nonferrous metals and products[4]	333-36	4	12	8	6	4	10	7	(2)	17	22	21	20	25	30	(2)	(2)
Fabricated metal products	34	38	57	24	13	11	12	13	14	27	36	44	36	41	49	80	57
Machinery	35	272	343	250	322	315	401	429	511	509	532	477	382	335	647	694	859
Office, computing, and accounting machines	357	(5)	(5)	(5)	(5)	(5)	(2)	(2)	(2)	486	509	435	327	256	(2)	(2)	(2)
Other machinery, except electrical	351-56,358-59	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	42	55	79	(2)	(2)	(2)
Electrical equipment	36	1,196	1,337	1,849	2,296	2,258	2,367	2,410	2,307	2,307	2,555	2,648	2,766	3,309	3,744	3,920	4,590
Radio and TV receiving equipment	365	(7)	(7)	(7)	(2)	(2)	(2)	(2)	(2)	(2)	0	11	28	53	210	(2)	(2)
Communication equipment	366	518	615	1,209	1,495	1,479	1,417	1,362	1,137	1,057	1,093	1,166	1,236	1,586	1,657	1,783	2,181
Electronic components	367						125	146	184	(2)	(2)	(2)	(2)	(2)	382	361	392
Other electrical equipment	361-64,369	678	722	640	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	1,495	(2)	(2)
Motor vehicles and motor vehicles equipment	371	190	296	291	360	309	293	385	288	318	383	471	498	729	655	587	601
Other transportation equipment	373-75,379						26	39	47	47	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Aircraft and missiles	372,376	2,275	2,276	4,261	4,531	3,864	3,970	3,899	4,000	4,428	4,921	5,486	5,713	5,840	6,628	8,528	10,151
Professional and scientific instruments	38	109	137	81	189	164	161	160	167	172	163	221	330	493	573	637	646
Scientific and mechanical measuring instruments	381-82	80	93	16	37	14	13	11	10	15	15	47	110	203	350	(2)	(2)
Optical, surgical, photographic, and other instruments	383-87	29	44	65	152	150	148	149	157	157	148	174	220	290	223	(2)	(2)
Other manufacturing industries	21,27,31,39	74	72	3	(2)	(2)	(2)	(2)	(2)	7	5	39	0	0	25	(2)	(2)
Nonmanufacturing industries[3]	07-17,41-67,737, 739,807,891	0	62	190	387	452	431	416	463	310	375	417	527	681	779	858	988
Distribution by size of company (based on number of employees)																	
Less than 1,000	....	167	233	194	228	318	326	307	367	273	299	208	212	389	354	424	525
1,000 to 4,999	....	226	[8]202	425	351	367	372	357	378	253	270	237	345	590	444	562	645
5,000 to 9,999	....	3,942	[8]4,324	6,651	251	214	186	187	230	288	313	390	241	228	432	619	665
10,000 to 24,999	....				7,536	6,766	619	505	430	371	548	835	1,075	1,179	1,150	1,225	1,445
25,000 or more	....						6,514	6,789	6,815	7,420	8,130	8,815	9,316	10,132	11,648	13,551	15,77

[1] Less than $0.5 million.
[2] Not separately available but included in total. See general notes.
[3] For 1957 and 1958 textiles and apparel and lumber, wood products, and furniture are included in the nonmanufacturing industries group.
[4] SIC codes 3398 and 3399 included in the nonferrous metals and products group for 1957-63.
[5] Data not tabulated at this level prior to 1972.
[6] Data not tabulated at this level prior to 1977.
[7] Included in the other electrical equipment group.
[8] Estimated by the National Science Foundation.

SOURCE: National Science Foundation.

Table B-10. Federal funds for research and development by industry and size of company: 1982

[Dollars in millions]

Industry	SIC code	Total	Companies with total employment of--				
			Less than 1,000	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Total		$19,059	$525	$645	$665	$1,445	$15,779
Food and kindred products	20	(1)	(1)	0	(1)	(1)	0
Textiles and apparel	22,23	(1)	(1)	(1)	(1)	0	0
Lumber, wood products, and furniture	24,25	0	0	0	0	0	0
Paper and allied products	26	0	0	0	0	0	0
Chemicals and allied products	28	433	(1)	(1)	(1)	(1)	397
Industrial chemicals	281-82,286	422	(1)	(1)	(1)	(1)	(1)
Drugs and medicines	283	(1)	0	(1)	0	(1)	(1)
Other chemicals	284-85,287-89	(1)	(1)	0	0	(1)	0
Petroleum refining and related industries	29	(1)	0	0	0	(1)	(1)
Rubber products	30	(1)	(1)	(1)	(1)	(1)	(1)
Stone, clay, and glass products	32	(1)	0	0	0	(1)	0
Primary metals	33	279	(1)	2	(1)	(1)	(1)
Ferrous metals and products	331-32,3398-99	(1)	0	(1)	(1)	(1)	(1)
Nonferrous metals and products	333-36	(1)	(1)	(1)	0	0	(1)
Fabricated metal products	34	57	0	20	(1)	(1)	(1)
Machinery	35	859	(1)	27	(1)	8	808
Office, computing, and accounting machines	357	(1)	(1)	(1)	0	(1)	(1)
Other machinery, except electrical	351-56,358-59	(1)	(1)	(1)	(1)	(1)	(1)
Electrical equipment	36	4,590	27	131	155	405	3,871
Radio and TV receiving equipment	365	(1)	(1)	0	0	0	(1)
Communication equipment	366	2,181	(1)	111	(1)	398	1,551
Electronic components	367	392	(1)	(1)	(1)	(1)	(1)
Other electrical equipment	361-64,369	(1)	5	(1)	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371	601	(1)	0	(1)	(1)	508
Other transportation equipment	373-75,379	(1)	(1)	0	0	(1)	(1)
Aircraft and missiles	372,376	10,151	(1)	96	(1)	489	9,210
Professional and scientific instruments	38	646	(1)	43	135	(1)	428
Scientific and mechanical measuring instruments	381-82	(1)	(1)	(1)	(1)	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	(1)	(1)	(1)	(1)	0	(1)
Other manufacturing industries	21,27,31,39	(1)	1	0	0	(1)	(1)
Nonmanufacturing industries	07-17,41-67,737,739,807,891	988	289	315	(1)	230	(1)

[1] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

Table B-11. R&D-performing companies with 1,000 or more employees and number with Federal R&D funds by industry and size of company: 1982

Industry	SIC code	Companies with total employment of--									
		1,000 or more		1,000 to 4,999		5,000 to 9,999		10,000 to 24,999		25,000 or more	
		Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal
Total	....	1,329	227	785	71	215	33	196	52	133	71
Food and kindred products	20	106	2	51	0	24	1	22	1	9	0
Textiles and apparel	22,23	66	2	39	1	13	1	10	0	4	0
Lumber, wood products, and furniture	24,25	42	1	29	0	8	0	3	0	2	1
Paper and allied products	26	54	2	33	0	5	0	11	1	5	1
Chemicals and allied products	28	117	20	66	3	19	2	22	9	10	6
Industrial chemicals	281-82,286	35	13	14	2	9	2	6	4	6	5
Drugs and medicines	283	34	5	16	1	5	0	10	3	3	1
Other chemicals	284-85,287-89	48	2	36	0	5	0	6	2	1	0
Petroleum refining and related industries	29	23	11	5	0	1	1	6	2	11	8
Rubber products	30	37	8	25	2	5	1	4	2	3	3
Stone, clay, and glass products	32	37	3	21	0	3	0	11	3	2	0
Primary metals	33	75	15	45	5	11	1	6	2	13	7
Ferrous metals and products	331-32,3398-99	54	9	34	3	7	1	3	1	10	4
Nonferrous metals and products	333-36	21	6	11	2	4	0	3	1	3	3
Fabricated metal products	34	69	9	46	3	14	2	5	2	4	2
Machinery	35	177	19	117	8	24	3	23	3	13	5
Office, computing, and accounting machines	357	40	5	26	2	3	0	5	1	6	2
Other machinery, except electrical	351-56,358-59	137	14	91	6	21	3	18	2	7	3
Electrical equipment	36	146	42	90	17	22	6	19	7	15	12
Radio and TV receiving equipment	365	11	1	8	0	0	0	2	0	1	1
Communication equipment	366	32	19	18	9	4	2	5	3	5	5
Electronic components	367	36	12	21	4	7	3	4	2	4	3
Other electrical equipment	361-64,369	67	10	43	4	11	1	8	2	5	3
Motor vehicles and motor vehicles equipment	371	36	12	19	1	7	3	5	3	5	5
Other transportation equipment	373-75,379	18	3	10	0	2	0	4	1	2	2
Aircraft and missiles	372,376	34	26	13	6	4	3	6	6	11	11
Professional and scientific instruments	38	55	21	35	11	9	2	5	3	6	5
Scientific and mechanical measuring instruments	381-82	30	14	20	7	4	1	3	3	3	3
Optical, surgical, photographic, and other instruments	383-87	25	7	15	4	5	1	2	0	3	2
Other manufacturing industries	21,27,31,39	78	2	49	0	13	0	10	1	6	1
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	159	29	92	14	31	7	24	6	12	2

SOURCE: National Science Foundation.

Table B-12. Industry-administered federally funded research and development centers--composition of work force and funds by character of work: 1981-82

[Dollars in millions]

Item	1981	1982
Total R&D funds[1]	$1,385	$1,493
Basic research	[2]137	([3])
Applied research	[2]298	([3])
Development	[2]950	([3])
	January	
	1982	1983
Full-time-equivalent R&D scientists and engineers	8,530	8,057
	March	
	1981	1982
Total employment	25,623	25,100

[1] All of these funds were devoted to Federal R&D activities.

[2] Detailed data for 1981 were estimated based upon (a) data actually reported for 1981 and (b) a revised total reported in the 1982 survey.

[3] Data not collected for 1982.

SOURCE: National Science Foundation.

Table B-13. R&D-performing companies in manufacturing and nonmanufacturing industries by size of company: 1982

Size of company (based on number of employees)	Number of companies reporting R&D funds		
	Total	Manufacturing	Nonmanufacturing
Total	13,829	([1])	([1])
Less than 1,000	[2]12,500	([1])	([1])
1,000 to 4,999	785	693	92
5,000 to 9,999	215	184	31
10,000 to 24,999	196	172	24
25,000 or more	133	121	12

[1] Not separately available but included in total. See general notes.

[2] Estimated by the Census Bureau based on the 1981 survey of companies with fewer than 1,000 employees. This figure is not comparable to estimates published in earlier volumes due to a change in the estimating procedure used to derive this number.

SOURCE: National Science Foundation.

Table B-14. R&D-performing companies with 1,000 or more employees by size of company and R&D program: 1982

Size of company (based on number of employees)	Total	Size of R&D program [Dollars in thousands]				
		Less than $200	$200 to $999	$1,000 to $9,999	$10,000 to $99,999	$100,000 or more
Total	1,329	125	253	539	326	86
1,000 to 4,999	785	105	209	375	96	0
5,000 to 9,999	215	13	28	95	75	4
10,000 to 24,999	196	4	12	57	101	22
25,000 or more	133	3	4	12	54	60

SOURCE: National Science Foundation.

Table B-15. R&D-performing manufacturing companies with 5,000 or more employees by industry and percent change in R&D funds: 1981-82

Industry	SIC code	Total number of companies	10 percent or more increase	10 percent or more decrease	Less than 10 percent change
Total	....	477	230	62	185
Food and kindred products	20	55	32	4	19
Textiles and apparel	22,23	27	8	3	16
Lumber, wood products, and furniture	24,25	13	3	3	7
Paper and allied products	26	21	9	5	7
Chemicals and allied products	28	51	32	4	15
Industrial chemicals	281-82,286	21	12	1	8
Drugs and medicines	283	18	16	1	1
Other chemicals	284-85,287-89	12	4	2	6
Petroleum refining and related industries	29	18	9	2	7
Rubber products	30	12	3	3	6
Stone, clay, and glass products	32	16	3	3	10
Primary metals	33	30	10	7	13
Ferrous metals and products	331-32,3398-99	20	7	4	9
Nonferrous metals and products	333-36	10	3	3	4
Fabricated metal products	34	23	8	5	10
Machinery	35	60	31	10	19
Office, computing, and accounting machines	357	14	9	1	4
Other machinery, except electrical	351-56,358-59	46	22	9	15
Electrical equipment	36	56	32	6	18
Radio and TV receiving equipment	365	3	2	0	1
Communication equipment	366	14	12	1	1
Electronic components	367	15	13	1	1
Other electrical equipment	361-64,369	24	6	4	14
Motor vehicles and motor vehicles equipment	371	17	3	4	10
Other transportation equipment	373-75,379	8	3	0	5
Aircraft and missiles	372,376	21	14	1	6
Professional and scientific instruments	38	20	12	1	7
Scientific and mechanical measuring instruments	381-82	10	6	0	4
Optical, surgical, photographic, and other instruments	383-87	10	6	1	3
Other manufacturing industries	21,27,31,39	29	18	1	10

Note: Manufacturing companies with 5,000 or more employees are classified into those increasing 10 percent or more, those decreasing 10 percent or more, or those changing less than 10 percent based on their ratio of change for total R&D funds between 1981 and 1982.

SOURCE: National Science Foundation.

[illegible] AVAILABLE

Table B-16. Percent of total, Federal, and company funds of R&D-performing companies ranked by size of R&D program: 1972-82

Companies ranked by size of R&D program (based on total R&D funds)[1]	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
	Percent of total R&D funds										
First 4 (1-4)	18	19	20	20	20	20	19	20	17	18	20
Next 4 (5-8)	16	15	15	15	14	14	14	13	14	12	12
Next 12 (9-20)	21	22	21	19	20	19	19	19	18	20	20
Next 20 (21-40)	12	11	11	12	12	13	13	13	13	12	13
Next 60 (41-100)	13	13	15	15	15	15	15	15	15	18	15
Next 100 (101-200)	7	8	8	8	8	9	9	9	9	9	9
Next 200 (201-400)	6	6	6	6	6	6	6	6	6	6	6
	Percent of Federal R&D funds										
First 4 (1-4)	10	10	19	21	19	20	17	10	14	20	21
Next 4 (5-8)	32	31	22	23	23	23	24	27	20	18	18
Next 12 (9-20)	29	30	31	29	30	30	31	34	32	31	31
Next 20 (21-40)	16	15	11	12	11	12	11	11	15	13	13
Next 60 (41-100)	7	7	9	9	12	12	13	12	12	12	12
Next 100 (101-200)	2	3	4	4	3	3	4	4	4	3	3
Next 200 (201-400)	3	3	2	2	2	1	1	2	3	3	2
	Percent of company R&D funds										
First 4 (1-4)	24	25	20	19	20	20	20	24	18	18	18
Next 4 (5-8)	5	5	11	10	9	8	9	7	11	10	9
Next 12 (9-20)	15	15	13	13	13	13	13	12	12	14	14
Next 20 (21-40)	9	9	11	11	12	13	13	14	12	12	13
Next 60 (41-100)	17	17	17	17	17	16	16	17	17	17	17
Next 100 (101-200)	11	11	11	10	11	12	11	11	11	11	12
Next 200 (201-400)	8	8	8	8	8	8	8	8	8	8	8

[1] Companies were ranked individually for each year; therefore, particular companies comprising the size groups may have changed from year to year.

SOURCE: National Science Foundation.

Table B-17. Net sales of R&D-performing companies by industry and size of company: 1981-82

[Dollars in millions]

Industry	SIC code	1981						1982					
			Companies with total employment of--						Companies with total employment of--				
		Total	Less than 1,000	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more	Total	Less than 1,000	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Total	....	$1,787,401	$135,587	$185,905	$159,676	$392,531	$913,701	$1,751,781	$132,162	$179,011	$155,266	$381,070	$904,271
Food and kindred products	20	174,216	11,437	23,004	26,925	76,774	36,077	170,231	10,671	22,037	25,851	71,223	40,449
Textiles and apparel	22,23	29,506	2,968	5,059	5,235	8,619	7,626	26,792	2,743	4,482	4,787	7,905	6,875
Lumber, wood products, and furniture	24,25	19,240	2,335	4,364	(1)	3,688	(1)	18,294	(1)	4,041	3,942	(1)	(1)
Paper and allied products	26	54,511	2,885	8,611	2,899	20,416	19,700	53,331	2,825	8,155	2,893	20,200	19,258
Chemicals and allied products	28	155,504	10,456	17,887	22,054	40,470	64,637	157,957	10,601	20,366	22,356	40,824	63,810
Industrial chemicals	281-82,286	86,281	3,245	4,862	13,733	14,579	49,863	82,069	3,095	4,620	13,661	13,206	47,487
Drugs and medicines	283	32,747	1,080	4,433	(1)	16,568	(1)	35,753	(1)	4,824	4,103	18,247	(1)
Other chemicals	284-85,287-89	36,476	6,131	8,593	(1)	9,323	(1)	40,135	(1)	10,922	4,592	9,371	(1)
Petroleum refining and related industries	29	308,383	(1)	7,959	(1)	63,463	231,851	282,089	(1)	7,631	(1)	60,394	209,570
Rubber products	30	31,693	4,789	4,469	2,749	8,311	11,374	30,299	4,503	4,339	2,472	7,855	11,129
Stone, clay, and glass products	32	29,845	3,603	4,411	(1)	13,363	(1)	27,317	3,135	3,863	(1)	12,596	(1)
Primary metals	33	101,827	4,132	12,451	10,126	8,707	66,410	90,982	3,542	10,438	9,143	8,443	59,415
Ferrous metals and products	331-32,3398-99	74,118	1,707	8,569	(1)	(1)	54,933	66,809	1,460	7,114	4,698	4,239	49,298
Nonferrous metals and products	333-36	27,709	2,425	3,882	(1)	(1)	11,477	24,174	2,082	3,324	4,446	4,204	10,118
Fabricated metal products	34	45,046	8,169	9,460	7,918	5,886	13,614	43,119	7,502	8,588	7,978	5,460	13,491
Machinery	35	137,905	20,573	21,566	12,673	28,764	54,330	128,517	17,452	19,284	11,717	26,207	53,858
Office, computing, and accounting machines	357	39,620	1,800	3,028	990	5,104	28,698	45,619	(1)	3,562	(1)	5,463	33,565
Other machinery, except electrical	351-56,358-59	98,285	18,773	18,538	11,683	23,660	25,632	82,898	(1)	15,722	(1)	20,744	20,292
Electrical equipment	36	151,870	8,871	12,960	10,186	24,658	95,195	153,317	8,909	12,428	10,272	24,944	96,763
Radio and TV receiving equipment	365	13,587	791	849	(1)	(1)	(1)	13,949	819	922	0	(1)	(1)
Communication equipment	366	49,335	1,599	1,952	(1)	(1)	38,336	50,164	1,604	2,203	1,731	6,409	38,217
Electronic components	367	21,302	2,552	2,106	3,072	(1)	(1)	25,799	2,853	2,403	3,457	(1)	(1)
Other electrical equipment	361-64,369	67,646	3,929	8,052	5,471	11,569	38,624	63,405	3,633	6,900	5,084	10,350	37,438
Motor vehicles and motor vehicles equipment	371	107,513	1,600	2,921	5,087	7,070	90,835	105,371	1,515	2,848	4,617	6,678	89,712
Other transportation equipment	373-75,379	30,299	(1)	1,832	(1)	1,907	(1)	37,702	(1)	2,001	1,005	(1)	(1)
Aircraft and missiles	372,376	74,734	708	1,862	2,930	7,766	61,469	76,860	835	2,195	2,908	8,070	62,852
Professional and scientific instruments	38	44,403	6,298	5,234	4,160	5,612	23,099	45,652	6,529	5,214	3,999	5,339	24,571
Scientific and mechanical measuring instruments	381-82	18,025	3,467	2,380	(1)	3,762	(1)	18,765	3,622	2,467	1,460	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	26,377	2,831	2,854	(1)	1,851	(1)	26,887	2,907	2,747	2,540	(1)	(1)
Other manufacturing industries	21,27,31,39	92,688	34,603	12,757	8,141	12,473	24,713	96,709	36,764	12,560	8,860	12,798	25,728
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	198,216	8,816	29,099	28,502	54,586	77,213	207,241	9,371	28,441	27,850	56,869	84,710

[1] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

Table B-18. R&D funds as a percent of net sales in R&D-performing manufacturing companies by industry and size of company: 1957-58, 1963, 1967, and 1971-82

[Dollars in millions]

Industry and size of company	SIC code	1957	1958	1963	1967	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Total	....	3.4	3.8	4.5	4.2	3.5	3.4	3.3	3.1	3.1	3.1	2.9	2.9	2.6	3.0	3.1	3.7
Distribution by industry																	
Food and kindred products	20	.3	.3	.4	.5	.5	.4	.4	.4	.4	.4	.4	.4	.4	.4	(1)	(1)
Textiles and apparel	22,23	(1)	.3	.5	.5	.5	.4	.4	.4	.4	.4	.4	.4	.4	.4	(1)	(1)
Lumber, wood products, and furniture	24,25	(1)	.4	.5	.3	.7	.8	.7	.8	.7	.7	.8	.7	.7	.8	.8	.9
Paper and allied products	26	.6	.7	.8	.9	.9	.8	.7	.8	.9	1.0	.9	.9	1.0	1.0	(1)	1.2
Chemicals and allied products	28	3.5	3.8	4.3	4.6	3.7	3.6	3.5	3.5	3.7	3.7	3.6	3.6	3.5	3.6	3.6	4.2
Industrial chemicals	281-82,286	5.0	5.4	5.1	4.8	3.9	3.9	3.6	3.3	3.6	3.7	3.5	3.5	3.2	3.3	3.2	3.9
Drugs and medicines	283	3.6	4.1	4.7	6.1	6.2	6.5	6.5	6.3	6.4	6.3	6.4	6.2	6.1	6.2	(1)	(1)
Other chemicals	284-85,287-89	1.3	1.5	2.8	2.3	1.9	1.7	1.6	1.6	1.7	1.7	1.8	1.8	1.8	1.9	(1)	(1)
Petroleum refining and related industries	29	.7	1.1	1.0	.8	.9	.8	.7	.6	.7	.6	.7	.7	.7	.6	(1)	(1)
Rubber products	30	1.7	1.8	2.3	1.9	2.2	2.6	2.6	2.5	2.5	2.4	2.1	1.9	1.9	2.2	(1)	(1)
Stone, clay, and glass products	32	(2)	(2)	1.6	1.8	1.8	1.7	1.7	1.7	1.2	1.2	1.3	1.3	1.3	1.4	(1)	(1)
Primary metals	33	.5	.7	.8	.8	.8	.7	.7	.6	.8	.8	.7	.7	.6	.7	.9	1.1
Ferrous metals and products[3]	331-32,3398-99	(1)	.6	.7	.8	.7	.6	.5	.5	.6	.6	.6	.6	.6	.7	(1)	(1)
Nonferrous metals and products[3]	333-36	(1)	.7	1.1	1.0	1.0	.9	.9	1.0	1.2	1.2	1.0	.8	.7	.7	(1)	(1)
Fabricated metal products	34	1.6	1.7	1.6	1.3	1.2	1.1	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.4	1.4	1.3
Machinery	35	3.4	3.8	4.2	4.2	4.0	4.3	4.6	4.6	4.8	4.9	4.9	4.6	4.5	5.0	4.9	6.1
Office, computing, and accounting machines	357	(4)	(4)	(4)	(4)	(4)	11.1	11.6	12.6	12.0	11.6	11.5	11.1	11.0	12.0	(1)	(1)
Other machinery, except electrical	351-56,358-59	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	2.2	2.1	2.1	2.3	(1)	(1)
Electrical equipment	36	7.6	10.3	10.1	8.6	7.2	7.1	6.9	6.6	6.5	6.7	6.9	5.8	6.0	6.6	6.8	7.8
Radio and TV receiving equipment	365	(6)	(6)	(6)	1.9	2.4	1.6	1.7	1.7	1.4	1.4	1.8	1.8	2.5	4.3	(1)	(1)
Communication equipment	366	(1)	11.3	13.0	10.3	8.2	8.7	8.1	7.6	7.6	7.6	7.7	7.7	8.8	9.1	9.6	11.5
Electronic components	367						5.9	6.2	6.2	6.9	7.3	6.8	6.7	7.1	7.9	7.4	7.0
Other electrical equipment	361-64,369	(1)	9.7	7.3	7.3	6.4	6.3	6.3	6.3	6.0	6.3	5.2	5.1	4.9	4.9	(1)	(1)
Motor vehicles and motor vehicles equipment	371	2.9	4.2	3.4	3.4	3.1	3.3	3.5	3.7	3.5	3.2	3.1	3.3	3.8	4.9	4.5	4.7
Other transportation equipment	373-75,379						1.0	1.2	1.3	1.3	1.3	1.2	.8	.8	.6	(1)	(1)
Aircraft and missiles	372,376	16.8	17.7	26.7	19.7	16.2	16.6	13.3	14.1	12.7	12.7	13.3	12.3	12.9	13.7	16.0	18.3
Professional and scientific instruments	38	7.0	7.8	5.9	5.4	5.7	5.9	6.1	6.1	5.9	6.2	6.3	6.9	7.3	7.5	8.1	8.9
Scientific and mechanical measuring instruments	381-82	9.5	10.2	4.1	3.9	3.7	4.1	4.3	4.5	4.9	5.4	6.3	7.1	7.3	8.4	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	5.2	6.3	6.9	6.0	6.4	6.6	6.8	6.7	6.3	6.4	6.4	6.8	7.2	6.9	(1)	(1)
Other manufacturing industries	21,27,31,39	(1)	1.3	.7	.6	.8	.8	.8	.9	.8	.7	.6	.5	.4	.4	(1)	(1)
Distribution by size of company (based on number of employees)																	
Less than 1,000	....	[7]1.8	1.3	1.9	1.7	1.7	1.7	1.6	1.8	1.6	1.7	1.5	1.6	1.6	1.4	1.5	1.6
1,000 to 4,999	....	1.8	1.8	2.4	1.7	1.6	1.7	1.6	1.5	1.4	1.4	1.6	1.6	1.8	1.8	1.7	2.0
5,000 to 9,999	....	[7]3.9	4.8	5.3	2.1	2.2	1.9	1.8	1.8	1.8	1.9	2.0	1.4	1.3	1.4	2.1	(1)
10,000 to 24,999	....				5.2	4.2	1.9	1.7	1.6	1.7	1.8	1.9	1.9	1.7	1.7	1.9	2.3
25,000 or more	....						4.7	4.5	4.2	4.5	4.2	4.2	4.0	3.8	4.0	4.6	(1)

---

[1] Not separately available but included in total. See general notes.

[2] Included in other manufacturing industries group.

[3] SIC codes 3398 and 3399 included in the nonferrous metals and products group for 1957-63.

[4] Data not tabulated at this level prior to 1972.

[5] Data not tabulated at this level prior to 1977.

[6] Included in the other electrical equipment group.

[7] Separate data for companies with 5,000 or more employees and for companies with 1,000 to 4,999 employees were estimated by the National Science Foundation for 1957. Revisions of statistics by the U.S. Bureau of the Census for this year did not yield separate data for companies in these size groups.

SOURCE: National Science Foundation.

Table B-19. Company R&D funds as a percent of net sales in R&D-performing manufacturing companies by industry and size of company: 1957-58, 1963, 1967, and 1971-82

[Dollars in millions]

Industry and size of company	SIC code	1957	1958	1963	1967	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Total	....	1.5	1.6	1.9	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.1	2.2	2.5
Distribution by industry																	
Food and kindred products	20	.3	.3	(1)	.5	.5	.4	.4	.4	(1)	(1)	(1)	(1)	(1)	(1)	.4	.4
Textiles and apparel	22,23	(1)	.2	.4	(1)	.5	.4	.4	(1)	(1)	(1)	(1)	(1)	(1)	(1)	.4	.5
Lumber, wood products, and furniture	24,25	(1)	.4	(1)	.3	(1)	(1)	(1)	(1)	.7	.7	.8	.7	.7	.8	.8	.9
Paper and allied products	26	.6	.7	.8	(1)	(1)	.8	(1)	(1)	(1)	(1)	(1)	(1)	(1)	1.0	1.0	1.2
Chemicals and allied products	28	3.1	3.2	3.6	4.0	3.3	3.3	3.1	3.0	3.1	3.3	3.3	3.2	3.2	3.3	3.4	3.9
Industrial chemicals	281-82,286	4.2	4.3	4.1	3.9	3.3	3.2	3.0	2.8	3.1	3.1	3.0	2.9	2.6	2.8	2.8	3.4
Drugs and medicines	283	3.6	4.0	4.5	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	6.1	6.3	7.1
Other chemicals	284-85,287-89	1.2	1.3	1.8	(1)	(1)	(1)	(2)	(1)	(1)	(1)	(1)	(1)	(1)	1.9	2.1	2.1
Petroleum refining and related industries	29	.7	1.1	1.2	.8	.8	.7	.7	.5	(1)	.6	.6	.7	.6	.5	.6	.7
Rubber products	30	1.1	1.4	1.6	1.7	1.7	1.7	1.7	(1)	(1)	(1)	(1)	(1)	(1)	(1)	1.9	2.2
Stone, clay, and glass products	32	(2)	(2)	1.6	1.7	1.6	1.6	1.5	1.5	(1)	(1)	(1)	(1)	(1)	1.3	1.4	1.5
Primary metals	33	.5	.6	.7	.8	.8	.7	.6	.5	.7	.8	.7	.6	.5	.5	.7	.8
Ferrous metals and products[3]	331-32,3398-99	(1)	.6	.7	.7	.7	.6	.5	(1)	.6	.6	.6	.5	.5	.5	.6	.7
Nonferrous metals and products[3]	333-36	(1)	.6	.9	.9	1.0	.9	.8	(1)	1.1	1.1	.9	.8	.6	.6	1.0	1.2
Fabricated metal products	34	1.1	1.1	1.4	1.2	1.1	1.1	1.2	1.1	1.1	1.1	1.1	1.0	1.0	1.2	1.2	1.2
Machinery	35	2.0	2.1	3.1	3.2	3.3	3.5	3.8	3.8	4.0	4.2	4.3	4.2	4.2	4.5	4.4	5.5
Office, computing, and accounting machines	357	(4)	(4)	(4)	(4)	(4)	(1)	(1)	(1)	9.4	9.1	9.6	9.8	10.1	10.4	9.7	10.3
Other machinery, except electrical	351-56,358-59	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	2.1	2.0	2.0	2.2	2.3	2.8
Electrical equipment	36	2.6	3.3	3.6	3.5	3.5	3.5	3.5	3.5	3.6	3.7	3.4	3.4	3.6	3.9	4.2	4.8
Radio and TV receiving equipment	365	(6)	(6)	(6)	(1)	(1)	(1)	(1)	(1)	1.4	1.4	1.6	1.4	1.7	2.7	2.6	2.9
Communication equipment	366	(1)	3.3	4.2	3.9	3.8	3.9	3.9	3.9	4.2	4.3	4.4	4.5	5.0	5.4	6.0	7.2
Electronic components	367						3.7	3.9	3.9	(1)	(1)	(1)	(1)	(1)	5.9	5.7	5.5
Other electrical equipment	361-64,369	(1)	3.3	3.0	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	2.5	2.8	3.1
Motor vehicles and motor vehicles equipment	371	2.1	2.8	2.5	2.5	2.5	2.8	2.9	3.2	3.0	2.7	2.7	2.9	3.2	4.2	3.9	4.1
Other transportation equipment	373-75,379						.6	.6	.6	.6	.6	.7	(1)	(1)	.3	.3	.2
Aircraft and missiles	372,376	2.0	2.3	2.6	4.0	3.4	3.3	3.0	3.5	2.8	2.8	2.9	3.2	3.5	3.8	4.6	5.1
Professional and scientific instruments	38	3.9	4.1	4.2	3.5	4.5	4.8	5.1	5.2	5.1	5.4	5.4	5.7	5.8	6.1	6.7	7.5
Scientific and mechanical measuring instruments	381-82	4.0	4.0	3.1	2.5	3.3	3.8	4.0	4.4	4.7	5.3	5.7	5.9	5.8	6.2	6.9	7.6
Optical, surgical, photographic, and other instruments	383-87	3.8	4.1	4.8	3.9	4.9	5.1	5.5	5.5	5.2	5.5	5.4	5.6	5.9	6.0	6.6	7.3
Other manufacturing industries	21,27,31,39	(1)	(1)	.6	(1)	(1)	(1)	(1)	(1)	.7	.7	.6	.5	.4	.4	.4	.5
Distribution by size of company (based on number of employees)																	
Less than 1,000	....	[7]1.4	.7	1.5	1.6	1.5	1.5	1.5	1.6	1.4	1.5	1.5	1.4	1.5	1.2	1.4	1.4
1,000 to 4,999	....	1.2	1.3	1.5	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.4	1.4	1.4	1.4	1.5	1.7
5,000 to 9,999	....	[7]1.6	1.9	2.1	1.6	1.8	1.5	1.5	1.4	1.5	1.6	1.5	1.2	1.1	1.1	1.7	1.9
10,000 to 24,999	....				2.3	2.3	1.4	1.3	1.3	1.5	1.4	1.4	1.4	1.4	1.4	1.6	2.0
25,000 or more	....						2.5	2.5	2.4	2.6	2.5	2.4	2.5	2.4	2.5	2.7	3.1

---

[1] Not separately available but included in total. See general notes.
[2] Data included in other manufacturing industries group.
[3] SIC codes 3398 and 3399 included in the nonferrous metals and products group for 1957-63.
[4] Data not tabulated at this level prior to 1972.
[5] Data not tabulated at this level prior to 1977.
[6] Included in the other electrical equipment group.
[7] Estimated by the National Science Foundation.

SOURCE: National Science Foundation.

Table B-20. R&D funds as a percent of net sales in R&D-performing manufacturing companies ranked by size of R&D program by industry: 1982

Industry	SIC code	First 4 companies	Next 4 companies	Next 12 companies
Total	....	12.9	10.9	8.4
Food and kindred products	20	1.0	.8	.7
Textiles and apparel	22,23	1.0	.6	.5
Lumber, wood products, and furniture	24,25	1.6	.9	.7
Paper and allied products	26	3.3	1.7	.5
Chemicals and allied products	28	5.0	5.9	6.4
Industrial chemicals	281-82,286	5.0	5.3	2.5
Drugs and medicines	283	11.1	7.9	5.9
Other chemicals	284-85,287-89	3.3	3.0	1.6
Petroleum refining and related industries	29	1.2	.7	.3
Rubber products	30	4.3	3.2	2.6
Stone, clay, and glass products	32	4.8	1.3	.8
Primary metals	33	1.5	1.2	.9
Ferrous metals and products	331-32,3398-99	1.3	1.3	.7
Nonferrous metals and products	333-36	1.5	1.4	1.1
Fabricated metal products	34	2.2	1.4	1.7
Machinery	35	14.2	6.9	5.9
Office, computing, and accounting machines	357	14.8	7.8	6.9
Other machinery, except electrical	351-56,358-59	6.1	5.1	2.8
Electrical equipment	36	13.4	6.4	9.1
Radio and TV receiving equipment	365	4.8	5.5	2.0
Communication equipment	366	12.4	13.2	7.3
Electronic components	367	8.4	12.0	5.3
Other electrical equipment	361-64,369	9.2	3.2	2.0
Motor vehicles and motor vehicles equipment	371	5.3	3.9	1.1
Other transportation equipment	373-75,379	2.7	2.2	.0
Aircraft and missiles	372,376	34.0	16.3	8.1
Professional and scientific instruments	38	11.1	11.9	6.8
Scientific and mechanical measuring instruments	381-82	13.1	7.9	7.5
Optical, surgical, photographic, and other instruments	383-87	9.8	7.6	5.2
Other manufacturing industries	21,27,31,39	1.1	.2	.9

SOURCE: National Science Foundation.

Table B-21. Company R&D funds as a percent of net sales in R&D-performing manufacturing companies ranked by size of net sales by industry: 1982

[Dollars in millions]

Industry	SIC code	Company R&D funds		Net sales		Company R&D funds as a percent of net sales	
		First 8 companies	Next 12 companies	First 8 companies	Next 12 companies	First 8 companies	Next 12 companies
Total	....	$4,814	$7,183	$265,634	$207,574	1.8	3.5
Food and kindred products	20	249	152	58,332	42,787	.4	.4
Textiles and apparel	22,23	42	37	11,153	6,545	.4	.6
Lumber, wood products, and furniture	24,25	103	26	10,504	3,525	1.0	.7
Paper and allied products	26	378	161	27,165	14,940	1.4	1.1
Chemicals and allied products	28	2,011	1,141	60,792	29,930	3.3	3.8
Industrial chemicals	281-82,286	1,819	747	54,725	19,804	3.3	3.8
Drugs and medicines	283	1,203	982	18,504	12,879	6.5	7.6
Other chemicals	284-85,287-89	460	163	20,575	8,629	2.2	1.9
Petroleum refining and related industries	29	1,623	364	188,548	90,339	.9	.4
Rubber products	30	459	98	19,615	4,382	2.3	2.2
Stone, clay, and glass products	32	309	65	13,863	8,030	2.2	.8
Primary metals	33	353	192	48,537	21,760	.7	.9
Ferrous metals and products	331-32,3398-99	270	111	45,980	12,272	.6	.9
Nonferrous metals and products	333-36	211	41	17,343	4,722	1.2	.9
Fabricated metal products	34	236	86	18,667	8,113	1.3	1.1
Machinery	35	4,151	860	44,708	22,083	9.3	3.9
Office, computing, and accounting machines	357	3,900	518	36,379	5,348	10.7	9.7
Other machinery, except electrical	351-56,358-59	1,029	347	24,320	14,677	4.2	2.4
Electrical equipment	36	4,518	915	76,566	31,164	5.9	2.9
Radio and TV receiving equipment	365	365	14	12,996	611	2.8	2.2
Communication equipment	366	3,286	170	42,897	4,594	7.7	3.7
Electronic components	367	898	323	17,392	4,199	5.2	7.7
Other electrical equipment	361-64,369	1,345	251	43,097	8,679	3.1	2.9
Motor vehicles and motor vehicles equipment	371	4,276	53	95,745	6,161	4.5	.9
Other transportation equipment	373-75,379	69	15	35,244	2,009	.2	.8
Aircraft and missiles	372,376	2,587	1,229	53,457	19,970	4.8	6.2
Professional and scientific instruments	38	2,447	369	28,144	6,484	8.7	5.7
Scientific and mechanical measuring instruments	381-82	1,053	125	12,403	2,214	8.5	5.6
Optical, surgical, photographic, and other instruments	383-87	1,712	98	20,553	3,011	8.3	3.2
Other manufacturing industries	21,27,31,39	172	159	71,738	12,819	.2	1.2

SOURCE: National Science Foundation.

Table B-22. Percent of net sales and employment of R&D-performing companies ranked by size of R&D program: 1972-82

Companies ranked by size of R&D program (based on total R&D funds)[1]	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
	Percent of net sales										
First 4 (1-4)	10	9	6	6	9	9	9	9	5	5	5
Next 4 (5-8)	3	3	5	5	3	3	3	3	4	4	4
Next 12 (9-20)	6	6	5	6	6	6	6	5	8	9	8
Next 20 (21-40)	7	7	11	10	10	10	10	11	7	7	6
Next 60 (41-100)	16	17	16	16	16	14	14	14	17	17	17
Next 100 (101-200)	14	14	14	12	11	14	14	14	12	13	15
Next 200 (201-400)	15	16	17	15	16	16	17	17	14	13	15
	Percent of employment										
First 4 (1-4)	9	8	7	7	8	8	8	9	7	7	6
Next 4 (5-8)	4	4	5	5	4	4	4	4	4	4	4
Next 12 (9-20)	7	7	6	6	7	7	7	7	7	7	7
Next 20 (21-40)	8	8	9	8	9	8	8	8	8	8	8
Next 60 (41-100)	12	12	13	13	13	13	12	12	13	12	12
Next 100 (101-200)	12	12	11	11	11	13	13	13	13	13	14
Next 200 (201-400)	16	16	16	15	16	15	15	16	14	14	14

[1] Companies were ranked individually for each year; therefore, particular companies comprising the size groups may have changed from year to year.

SOURCE: National Science Foundation.

Table B-23. Percent of total and Federal R&D funds and of net sales of R&D-performing companies ranked by size of R&D program by industry: 1982

Industry	SIC code	Percent of total R&D funds			Percent of Federal R&D funds			Percent of net sales of all R&D performing companies		
		First 4 companies	Next 4	Next 12	First 4 companies	Next 4	Next 12	First 4 companies	Next 4	Next 12
Total..................................	....	20	12	20	27	18	31	5	4	8
Food and kindred products....................	20	28	15	26	0	0	83	12	8	17
Textiles and apparel.........................	22,23	38	14	20	5	0	0	18	10	20
Lumber, wood products, and furniture..........	24,25	64	12	11	100	0	0	34	11	14
Paper and allied products....................	26	64	12	16	95	5	0	23	8	35
Chemicals and allied products................	28	30	13	24	80	(1)	14	25	10	15
Industrial chemicals.........................	281-82,286	62	15	17	82	12	4	48	11	27
Drugs and medicines..........................	283	33	23	35	40	18	52	21	20	42
Other chemicals..............................	284-85,287-89	51	9	18	86	0	4	34	6	24
Petroleum refining and related industries................................	29	59	26	15	95	1	4	38	28	33
Rubber products..............................	30	65	14	10	96	(1)	3	44	12	11
Stone, clay, and glass products..............	32	66	16	11	99	1	0	25	24	25
Primary metals...............................	33	51	13	19	90	3	7	37	12	22
Ferrous metals and products..................	331-32,3398-99	65	13	16	98	1	1	52	10	24
Nonferrous metals and products...............	333-36	58	16	21	34	63	2	48	15	25
Fabricated metal products....................	34	40	17	17	62	1	32	24	16	13
Machinery....................................	35	54	11	14	78	0	17	23	10	14
Office, computing, and accounting machines..................................	357	76	11	8	89	0	10	62	16	14
Other machinery, except electrical...........	351-56,358-59	38	14	13	71	3	11	19	8	14
Electrical equipment.........................	36	54	15	15	62	16	17	31	19	13
Radio and TV receiving equipment.............	365	93	3	3	100	0	0	88	2	8
Communication equipment......................	366	76	14	7	65	26	8	71	12	11
Electronic components........................	367	56	17	18	87	(1)	12	46	10	24
Other electrical equipment...................	361-64,369	84	3	5	98	(1)	1	53	6	16
Motor vehicles and motor vehicles equipment..................................	371	92	6	1	83	15	2	83	7	6
Other transportation equipment...............	373-75,379	80	9	9	94	5	1	11	2	85
Aircraft and missiles........................	372,376	54	31	13	59	28	12	29	34	29
Professional and scientific instruments......	38	57	18	10	66	21	10	46	14	13
Scientific and mechanical measuring instruments................................	381-82	70	9	7	82	14	1	53	11	10
Optical, surgical, photographic, and other instruments...........................	383-87	79	10	5	95	0	2	66	10	8
Other manufacturing industries...............	21,27,31,39	42	21	16	95	2	0	20	7	10
Nonmanufacturing industries..................	07-17,41-67,737, 739,807,891	46	11	31	59	10	29	4	12	22

Note: All rankings are based on total R&D funds.

[1] Less than 0.5 percent.

SOURCE: National Science Foundation.

Table B-24. Expenditures for energy research and development by selected industry: 1972-83 (projected)

[Dollars in millions]

Industry	SIC code	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983 (projected)
Total	....	$750	$1,009	$1,399	$1,774	$2,073	$2,573	$2,965	$3,643	$4,162	$4,216	$4,334	$4,535
Food and kindred products	20	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	4	5	(1)	(1)
Textiles and apparel	22,23	0	0	0	0	1	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Lumber, wood products, and furniture	24,25	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	3	4	6	6
Paper and allied products	26	(1)	(1)	(1)	(1)	(1)	1	2	3	3	2	2	2
Chemicals and allied products	28	52	47	71	102	121	148	157	220	257	312	346	364
Industrial chemicals	281-82,286	47	46	69	100	(1)	(1)	(1)	(1)	246	305	336	353
Drugs and medicines	283	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Other chemicals	284-85,287-89	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Petroleum refining and related industries	29	285	310	371	405	440	536	648	776	845	1,067	1,183	1,459
Rubber products	30	(1)	(1)	(1)	(1)	(1)	10	12	12	15	17	17	14
Stone, clay, and glass products	32	(1)	(1)	(1)	(1)	4	6	7	17	21	24	11	10
Primary metals	33	10	17	22	27	33	51	49	72	78	80	101	83
Ferrous metals and products	331-32,3398-99	(1)	(1)	(1)	(1)	12	19	14	19	20	20	22	23
Nonferrous metals and products	333-36	(1)	(1)	(1)	(1)	21	32	33	48	58	59	79	60
Fabricated metal products	34	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Machinery	35	8	11	16	23	40	61	80	83	108	127	194	158
Office, computing, and accounting machines	357	(1)	(1)	(1)	(1)	(1)	(1)	(1)	13	17	6	20	21
Other machinery, except electrical	351-56,358-59	(1)	(1)	(1)	(1)	(1)	(1)	(1)	70	91	121	174	137
Electrical equipment	36	194	318	389	464	585	650	714	843	917	908	873	840
Radio and TV receiving equipment	365	0	0	0	0	0	0	0	0	3	(1)	(1)	(1)
Communication equipment	366	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Electronic components	367	(1)	(1)	(1)	(1)	(1)	5	5	13	12	15	18	(1)
Other electrical equipment	361-64,369	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Other transportation equipment	373-75,379	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Aircraft and missiles	372,376	65	111	142	134	110	165	283	372	446	412	352	357
Professional and scientific instruments	38	12	13	14	14	10	17	27	28	45	53	76	83
Scientific and mechanical measuring instruments	381,82	(1)	(1)	(1)	(1)	(1)	12	19	24	40	(1)	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	(1)	(1)	(1)	(1)	(1)	5	8	4	5	(1)	(1)	(1)
Other manufacturing industries	21,27,31,39	(1)	(1)	(1)	(1)	(1)	4	7	7	19	(1)	19	17
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	76	81	100	98	137	185	220	324	333	374	378	381

[1] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

Table B-25. Company funds for energy research and development by selected industry: 1973-82

[Dollars in millions]

Industry	SIC code	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Total	....	$624	$857	$1,152	$1,319	$1,632	$1,796	$2,230	$2,599	$2,680	$2,847
Chemicals and allied products	28	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	149	184
Petroleum refining and related industries	29	(1)	(1)	(1)	(1)	469	530	623	699	957	1,117
Electrical equipment	36	74	96	115	122	165	137	219	205	203	169
Aircraft and missiles	372,376	(1)	(1)	(1)	(1)	57	68	113	163	124	86
All other manufacturing industries	....	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	1,053	1,119
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	39	48	31	66	75	82	141	154	194	172

NOTE: Data not available for 1972.

[1] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

Table B-26. Federal funds for energy research and development by selected industry: 1973-82

[Dollars in millions]

Industry	SIC code	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Total	....	$385	$482	$622	$754	$941	$1,169	$1,413	$1,563	$1,536	$1,487
micals and allied products	28	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	163	162
roleum refining and related industries	29	(1)	(1)	(1)	(1)	67	118	153	146	109	66
ctrical equipment	36	244	293	349	463	485	577	624	711	705	704
craft and missiles	372,376	(1)	(1)	(1)	(1)	108	215	259	283	288	266
All other manufacturing industries	....	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	91	83
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	42	52	67	71	110	139	183	179	180	206

NOTE: Data not available for 1972.

[1] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

Table B-27. Industrial expenditures for energy research and development by primary energy source: 1972-83 (projected)

[Dollars in millions]

Primary energy source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983 (projected)
Total	$750	$1,009	$1,339	$1,774	$2,073	$2,573	$2,965	$3,643	$4,162	$4,216	$4,334	$4,535
Fossil fuels	(1)	438	516	550	605	757	843	1,063	1,228	1,437	1,498	1,587
Oil	(1)	297	329	333	381	[2]449	(1)	[2]557	(1)	[2]772	(1)	(1)
Gas	(1)	51	74	66	68	[2]93	(1)	[2]113	(1)	[2]208	(1)	(1)
Shale	(1)	12	18	19	24	[2]35	(1)	[2]24	(1)	[2]57	(1)	(1)
Coal	(1)	49	65	109	127	[2]175	(1)	[2]313	(1)	[2]383	(1)	(1)
Synthetic fossil fuels	(1)	(1)	21	50	74	[2]115	(1)	[2]236	(1)	[2]210	(1)	(1)
Mining	(1)	(1)	5	9	10	[2]9	(1)	[2]1	(1)	[2]31	(1)	(1)
Other	(1)	(1)	39	50	43	[2]51	(1)	[2]76	(1)	[2]142	(1)	(1)
Other fossil fuels	(1)	29	30	23	5	[2]5	(1)	[2]56	(1)	[2]17	(1)	(1)
Nuclear	(1)	501	601	700	799	926	995	1,037	1,056	1,037	1,082	1,079
Fission	(1)	476	567	659	741	[2]844	(1)	[2]913	(1)	[2]866	(1)	(1)
Fusion	(1)	25	34	41	58	[2]82	(1)	[2]124	(1)	[2]171	(1)	(1)
All other energy	(1)	70	222	524	669	890	1,127	1,543	1,878	1,742	1,752	1,869
Geothermal	(1)	1	2	6	13	[2]24	(1)	[2]149	(1)	[2]71	(1)	(1)
Solar	(1)	2	7	19	43	[2]66	(1)	[2]321	(1)	[2]298	(1)	(1)
Conservation and utilization	(1)	(1)	137	435	528	[2]687	(1)	[2]686	(1)	[2]405	(1)	(1)
All other sources	(1)	67	76	64	85	[2]115	(1)	[2]387	(1)	[2]968	(1)	(1)

[1] Data not collected.

[2] Detailed data for 1977, 1979, and 1981 were estimated based upon (a) data actually reported in those years, (b) revised data for those years which were reported on the 1978, 1980, and 1982 survey forms, and (c) adjustments due to new sample in 1981.

SOURCE: National Science Foundation.

Table B-28. Company funds for energy research and development by primary energy source: 1972-82

[Dollars in millions]

Primary energy source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Total	(1)	$624	$857	$1,152	$1,316	$1,632	$1,796	$2,230	$2,599	$2,680	$2,847
Fossil fuels	(1)	[2]428	[2]503	[2]507	[2]523	644	678	788	993	1,257	1,368
Oil	(1)	295	[2]326	[2]327	[2]369	[3]436	(1)	[3]529	(1)	[3]746	(1)
Gas	(1)	(4)	(4)	(4)	52	[3]73	(1)	[3]109	(1)	[3](4)	(1)
Shale	(1)	[2]12	(4)	(4)	(4)	[3](4)	(1)	[3](4)	(1)	[3](4)	(1)
Coal	(1)	42	56	77	80	[3]98	(1)	[3]130	(1)	[3]244	(1)
Synthetic fossil fuels	(1)	(1)	(4)	(4)	48	[3]64	(1)	[3]84	(1)	[3]132	(1)
Mining	(1)	(1)	(4)	(4)	7	[3]5	(1)	[3]1	(1)	[3]24	(1)
Other	(1)	(1)	33	34	25	[3]29	(1)	[3]45	(1)	[3]89	(1)
Other fossil fuels	(1)	(4)	(4)	(4)	(4)	[3](4)	(1)	[3](4)	(1)	[3](4)	(1)
Nuclear	(1)	135	157	160	198	217	217	169	150	126	96
Fission	(1)	127	[2]146	156	194	[3]211	(1)	[3]167	(1)	[3]70	(1)
Fusion	(1)	7	11	4	4	[3]6	(1)	[3]2	(1)	[3]56	(1)
All other energy	(1)	(4)	(4)	(4)	595	770	901	1,273	1,456	1,297	1,381
Geothermal	(1)	(4)	(4)	(4)	5	[3]9	(1)	[3]122	(1)	[3]40	(1)
Solar	(1)	(4)	(4)	(4)	17	[3]22	(1)	[3]251	(1)	[3]199	(1)
Conservation and utilization	(1)	(1)	[2]129	[2]425	[2]511	[3]656	(1)	[3]681	(1)	[3]334	(1)
All other sources	(1)	59	62	46	62	[3]83	(1)	[3]219	(1)	[3]724	(1)

[1] Data not collected.

[2] Revised by the National Science Foundation.

[3] Detailed data for 1977, 1979, and 1981 were estimated based upon (a) data actually reported in those years, (b) revised data for those years which were reported on the 1978, 1980, and 1982 survey forms, and (c) adjustments due to new sample in 1981.

[4] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

Table B-29. Federal funds for energy research and development by primary energy source: 1972-82

[Dollars in millions]

Primary energy source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Total	(1)	$385	$482	$622	$757	$941	$1,169	$1,413	$1,563	$1,536	$1,487
Fossil fuels	(1)	10	13	[2]63	[2]82	113	165	275	235	180	130
Oil	(1)	2	3	6	12	[3]13	(1)	[3]29	(1)	[3]26	(1)
Gas	(1)	(4)	(4)	(4)	16	[3]20	(1)	[3]6	(1)	[3](4)	(1)
Shale	(1)	0	(4)	(4)	(4)	[3](4)	(1)	[3](4)	(1)	[3](4)	(1)
Coal	(1)	7	9	32	47	[3]77	(1)	[3]183	(1)	[3]138	(1)
Synthetic fossil fuels	(1)	(1)	(4)	(4)	26	[3]51	(1)	[3]152	(1)	[3]78	(1)
Mining	(1)	(1)	(4)	(4)	3	[3]4	(1)	[3]0	(1)	[3]7	(1)
Other	(1)	(1)	6	16	18	[3]22	(1)	[3]31	(1)	[3]53	(1)
Other fossil fuels	(1)	(4)	(4)	(4)	(4)	[3](4)	(1)	[3](4)	(1)	[3](4)	(1)
Nuclear	(1)	366	444	540	601	709	778	868	906	911	986
Fission	(1)	349	421	503	547	[3]633	(1)	[3]746	(1)	[3]796	(1)
Fusion	(1)	18	23	37	54	[3]76	(1)	[3]122	(1)	[3]115	(1)
All other energy	(1)	(4)	(4)	(4)	76	120	226	270	422	445	371
Geothermal	(1)	(4)	(4)	(4)	8	[3]15	(1)	[3]27	(1)	[3]31	(1)
Solar	(1)	(4)	(4)	(4)	26	[3]42	(1)	[3]70	(1)	[3]99	(1)
Conservation and utilization	(1)	(1)	8	10	17	[3]31	(1)	[3]5	(1)	[3]71	(1)
All other sources	(1)	8	14	18	23	[3]32	(1)	[3]168	(1)	[3]244	(1)

[1] Data not collected.

[2] Revised by the National Science Foundation.

[3] Detailed data for 1977, 1979, and 1981 were estimated based upon (a) data actually reported in those years, (b) revised data for those years which were reported on the 1978, 1980, and 1982 survey forms, and (c) adjustments due to new sample in 1981.

[4] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

Table 8-30. Expenditures for pollution abatement research and development by industry: 1973-83 (projected)

[Dollars in millions]

Industry	SIC code	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983 (projected)
Total		$603	$657	$647	$754	$901	$1,065	$1,249	$1,202	(1)	(1)	(1)
Food and kindred products	20	4	3	3	3	3	2	2	3	1	2	2
Textiles and apparel	22,23	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Lumber, wood products, and furniture	24,25	3	5	4	4	5	3	3	4	5	4	4
Paper and allied products	26	1	4	5	6	6	8	(2)	(2)	(2)	(2)	(2)
Chemicals and allied products	28	51	61	71	72	82	79	146	178	186	192	205
Industrial chemicals	281-82,286	38	39	56	58	64	67	128	157	165	172	183
Drugs and medicines	283	(2)	(2)	(2)	(2)	(2)	(2)	4	4	5	6	7
Other chemicals	284-85,287-89	(2)	(2)	(2)	(2)	(2)	(2)	13	16	15	14	15
Petroleum refining and related industries	29	51	61	65	58	60	71	80	95	92	98	106
Rubber products	30	0	0	2	2	2	3	3	3	(2)	(2)	(2)
Stone, clay, and glass products	32	4	7	5	4	6	7	9	11	9	7	6
Primary metals	33	9	13	24	31	29	25	29	30	24	22	21
Ferrous metals and products	331-32,3398-99	8	11	17	19	18	13	14	14	16	13	14
Nonferrous metals and products	333-36	1	3	7	12	12	12	15	15	9	9	7
Fabricated metal products	34	(2)	(2)	(2)	(2)	(2)	(2)	6	7	3	11	8
Machinery	35	14	25	23	29	32	38	31	30	34	32	37
Office, computing, and accounting machines	357	0	0	0	0	0	0	0	1	0	0	0
Other machinery, except electrical	351-56,358-59	14	25	23	29	31	37	30	29	34	32	37
Electrical equipment	36	13	16	19	18	20	19	34	39	39	30	25
Radio and TV receiving equipment	365	0	0	0	0	0	0	0	0	0	0	0
Communication equipment	366	(2)	(2)	(2)	5	6	6	5	6	(2)	(2)	(2)
Electronic components	367	0	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Other electrical equipment	361-64,369	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Motor vehicles and motor vehicles equipment	371	380	384	347	413	487	593	(2)	(2)	(2)	(2)	(2)
Other transportation equipment	373-75,379	(2)	(2)	(2)	(2)	(2)	(2)	0	(2)	0	(2)	(2)
Aircraft and missiles	372,376	29	38	36	48	57	64	64	38	30	32	33
Professional and scientific instruments	38	(2)	(2)	(2)	(2)	3	4	3	(2)	(2)	(2)	(2)
Scientific and mechanical measuring instruments	381,82	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Optical, surgical, photographic, and other instruments	383-87	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Other manufacturing industries	21,27,31,39	2	2	1	2	3	3	2	3	(2)	(2)	(2)
Nonmanufacturing industries	07-17,41-67,737,739,807,891	36	29	34	55	61	102	104	79	77	62	62

[1] Data not available due to high rate of imputation or because of disclosure policy.

[2] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

Table B-31. Expenditures for pollution abatement research and development by industry and source of funds: 1981-82

[Dollars in millions]

Industry	SIC code	1981			1982		
		Total	Federal	Company	Total	Federal	Company
Total		(1)	$129	(1)	(1)	$122	(1)
Food and kindred products	20	1	0	1	2	0	2
Textiles and apparel	22,23	(2)	0	(2)	(2)	0	(2)
Lumber, wood products, and furniture	24,25	5	0	5	4	0	4
Paper and allied products	26	(2)	0	(2)	(2)	0	(2)
Chemicals and allied products	28	186	58	128	192	68	124
Industrial chemicals	281-82,286	165	58	107	172	68	104
Drugs and medicines	283	5	0	5	6	0	6
Other chemicals	284-85,287-89	15	0	15	14	0	14
Petroleum refining and related industries	29	92	0	92	98	0	98
Rubber products	30	(2)	(2)	(2)	(2)	(2)	(2)
Stone, clay, and glass products	32	9	0	9	7	0	7
Primary metals	33	24	0	24	22	0	22
Ferrous metals and products	331-32,3398-99	16	0	16	13	0	13
Nonferrous metals and products	333-36	9	0	9	9	0	9
Fabricated metal products	34	3	0	3	11	4	7
Machinery	35	34	2	32	32	0	32
Office, computing, and accounting machines	357	0	0	0	0	0	0
Other machinery, except electrical	351-56,358-59	34	2	32	32	0	32
Electrical equipment	36	39	20	19	30	12	18
Radio and TV receiving equipment	365	0	0	0	0	0	0
Communication equipment	366	(2)	0	(2)	(2)	0	(2)
Electronic components	367	(2)	0	(2)	(2)	0	(2)
Other electrical equipment	361-64,369	(2)	20	(2)	(2)	12	(2)
Motor vehicles and motor vehicles equipment	371	(2)	0	(2)	(2)	0	(2)
Other transportation equipment	373-75,379	0	0	0	(2)	0	(2)
Aircraft and missiles	372,376	30	10	20	32	10	22
Professional and scientific instruments	38	(2)	0	(2)	(2)	0	(2)
Scientific and mechanical measuring instruments	381,82	(2)	0	(2)	(2)	0	(2)
Optical, surgical, photographic, and other instruments	383-87	(2)	0	(2)	(2)	0	(2)
Other manufacturing industries	21,27,31,39	(2)	0	(2)	(2)	0	(2)
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	77	38	39	62	27	35

[1] Data not available due to high rate of imputation or because of disclosure policy.

[2] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

Table B-32. Industrial expenditures for pollution abatement research and development by type of pollution and source of funds: 1981-82

[Dollars in millions]

Industry	1981			1982		
	Total	Federal	Company	Total	Federal	Company
Total	(1)	$129	(1)	(1)	$122	(1)
Air	(1)	(1)	(1)	(3)	(3)	(3)
Automotive emission	(1)	(1)	(1)	(3)	(3)	(3)
Electric power plant emissions	[2]27	27	[2]20	(3)	(3)	(3)
All other	[2]112	[2](1)	[2]95	(3)	(3)	(3)
Water	[2]105	[2]8	[2]97	(3)	(3)	(3)
Solid waste	[2]96	[2]59	[2]37	(3)	(3)	(3)
Other	[2]65	[2](1)	[2]32	(3)	(3)	(3)

[1] Data not available due to high rate of imputation.

[2] Detailed data for 1981 were estimated based upon (a) data actually reported in that year, and (b) a revised total for that year which was reported on the 1982 survey form.

[3] Data not collected.

SOURCE: National Science Foundation.

Table B-33. Industrial expenditures for pollution abatement research and development by type of pollution: 1973-83 (projected)

[Dollars in millions]

Type of pollution	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983 (projected)
Total	$603	$657	$647	$754	$901	$1,065	$1,249	$1,202	(1)	(1)	(1)
Air	461	508	478	569	[2]676	(3)	[2]954	(3)	(1)	(3)	(3)
Automotive emission	(3)	383	348	426	[2]495	(3)	[2]736	(3)	(1)	(3)	(3)
Electric power plant emissions	(3)	25	28	31	[2]67	(3)	[2]70	(3)	[2]27	(3)	(3)
All other	(3)	100	102	112	[2]114	(3)	[2]148	(3)	[2]112	(3)	(3)
Water	76	60	71	84	[2]97	(3)	[2]120	(3)	[2]105	(3)	(3)
Solid waste	10	14	23	21	[2]28	(3)	[2]44	(3)	[2]96	(3)	(3)
Other	56	75	75	80	[2]100	(3)	[2]131	(3)	[2]65	(3)	(3)

[1] Data not available due to high rate of imputation.

[2] Detailed data for 1977, 1979, and 1981 were estimated based upon (a) data actually reported in those years, (b) revised totals for those years which were reported on the 1978, 1980, and 1982 survey forms, and (c) adjustments due to new sample in 1981.

[3] Data not collected.

SOURCE: National Science Foundation.

Table B-34. Full-time-equivalent number of R&D scientists and engineers by industry and size of company: 1957-58, 1963-64, 1967-68, and 1972-83

[In thousands]

Industry and size of company	SIC code	January																	
		1957	1958	1963	1964	1967	1968	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Total	....	229.4	234.8	327.3	340.2	367.2	376.7	350.2	357.7	360.0	363.3	364.4	382.8	404.4	423.9	450.6	487.8	509.8	535.6
Distribution by industry																			
Food and kindred products	20	3.8	4.8	5.1	5.7	6.1	6.3	6.5	6.6	6.4	6.8	6.9	6.9	6.9	7.4	7.2	7.4	7.4	7.6
Textiles and apparel	22,23	.7	.8	1.0	1.2	1.9	2.5	1.8	1.9	1.8	1.8	1.8	1.7	1.8	1.8	(1)	2.0	1.9	1.9
Lumber, wood products, and furniture	24,25	.8	.8	.5	.5	.5	.5	1.8	1.9	2.1	2.3	2.1	2.1	2.0	1.8	1.7	1.6	(1)	1.5
Paper and allied products	26	1.5	1.7	2.5	3.8	4.7	4.8	4.9	4.9	4.9	5.0	5.2	6.3	6.5	7.1	7.4	8.0	8.4	8.3
Chemicals and allied products	28	29.4	31.0	38.3	35.8	36.9	38.9	41.0	40.9	41.8	45.2	44.4	46.4	48.3	50.0	51.4	54.7	61.6	67.1
Industrial chemicals	281-82,286	18.0	18.8	22.9	22.2	21.7	22.3	19.1	19.1	19.1	21.1	20.1	20.6	21.3	21.4	20.9	21.6	25.9	26.4
Drugs and medicines	283	4.7	5.1	6.9	6.9	8.7	9.8	13.1	13.0	14.0	15.6	16.6	17.8	19.5	20.8	21.6	23.3	25.6	30.0
Other chemicals	284-85,287-89	6.7	7.1	8.5	6.7	6.5	6.8	8.8	8.8	8.7	8.5	7.8	8.0	7.5	7.8	8.9	9.8	10.1	10.7
Petroleum refining and related industries	29	6.9	7.4	8.9	8.1	8.7	9.2	8.3	8.2	8.2	8.4	8.6	8.9	9.9	10.1	10.8	13.0	15.6	15.1
Rubber products	30	4.7	4.7	5.8	6.0	5.8	6.1	6.7	7.5	7.7	8.4	8.6	9.1	7.9	8.1	(1)	10.3	8.1	(1)
Stone, clay, and glass products	32	(2)	(2)	3.8	3.3	3.3	4.1	4.1	4.2	4.5	4.5	4.6	4.5	5.1	5.2	5.4	5.6	5.1	5.0
Primary metals	33	5.1	5.2	5.2	5.1	5.9	5.9	6.4	6.0	6.4	6.3	8.1	8.4	8.1	7.9	8.1	7.9	8.4	8.0
Ferrous metals and products[3]	331-32,3398-99	2.9	3.0	2.9	2.8	3.3	3.1	3.4	3.2	3.3	3.3	3.9	3.9	4.2	4.3	4.7	4.8	5.2	5.1
Nonferrous metals and products[3]	333-36	2.2	2.2	2.3	2.3	2.5	2.7	3.0	2.8	3.1	3.0	4.2	4.5	3.9	3.6	3.4	3.1	3.2	3.0
Fabricated metal products	34	8.4	8.3	6.8	7.0	6.3	5.6	6.6	6.7	7.3	7.4	6.8	7.1	7.0	6.8	7.8	7.8	8.2	7.3
Machinery	35	24.9	27.4	31.4	27.3	33.6	37.4	43.7	46.3	51.0	52.8	55.7	55.3	57.8	60.2	62.1	69.2	76.0	76.4
Office, computing, and accounting machines	357	(4)	(4)	(4)	(4)	(4)	(4)	(4)	30.1	34.5	36.1	38.1	37.7	38.9	40.9	41.8	43.7	48.1	49.6
Other machinery, except electrical	351-56,358-59	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	18.9	19.3	20.3	25.5	27.9	26.8
Electrical equipment	36	42.9	47.9	85.8	89.5	98.6	98.4	83.6	85.4	82.6	82.6	80.3	84.1	84.4	85.0	94.5	106.9	109.8	113.9
Radio and TV receiving equipment	365	(6)	(6)	(6)	(6)	.9	1.0	2.1	1.4	1.3	1.0	1.1	.9	1.5	2.1	4.0	7.9	7.8	(1)
Communication equipment	366	19.2	22.3	55.1	60.4	66.7	67.4	53.2	45.3	42.0	40.2	37.4	38.0	39.0	40.4	42.4	44.2	45.9	47.7
Electronic components	367								9.4	9.6	10.6	10.2	13.0	14.2	14.0	18.1	22.8	24.4	26.4
Other electrical equipment	361-64,369	23.7	25.6	30.7	29.1	31.0	30.0	28.3	29.3	29.7	30.8	31.6	32.2	29.7	28.5	30.0	32.0	31.7	(1)
Motor vehicles and motor vehicles equipment	371	13.6	15.0	21.1	23.3	25.2	24.3	29.7	28.2	27.4	26.0	25.4	28.2	31.9	35.2	38.2	35.1	30.0	29.9
Other transportation equipment	373-75,379								1.7	1.8	1.9	1.7	1.9	1.9	2.0	1.5	1.4	1.2	1.4
Aircraft and missiles	372,376	58.7	58.6	90.7	101.1	100.4	101.1	70.8	72.1	70.6	67.5	66.9	72.0	82.0	86.5	85.9	95.2	91.1	99.5
Professional and scientific instruments	38	10.2	11.0	9.4	10.8	13.0	14.1	15.2	16.3	17.5	17.9	18.8	20.5	23.3	27.0	32.8	34.7	42.7	(1)
Scientific and mechanical measuring instruments	381-82	5.8	6.5	3.9	3.8	3.6	3.8	4.7	5.3	5.6	5.9	6.7	7.2	9.0	11.7	(1)	18.6	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	4.4	4.5	5.5	7.0	9.4	10.3	10.5	11.0	11.9	12.0	12.1	13.3	14.3	15.3	16.3	16.0	16.1	(1)
Other manufacturing industries	21,27,31,39	17.8	19.2	2.8	2.0	2.2	2.4	3.6	3.6	3.7	3.7	4.2	4.5	4.6	4.7	4.6	4.8	5.5	6.0
Nonmanufacturing industries	07-17,41-67,737,739,807,891			8.2	9.8	14.1	15.1	15.7	15.3	14.4	14.9	14.6	15.3	15.0	17.1	19.8	22.2	27.1	29.7
Distribution by size of company (based on number of employees)																			
Less than 1,000	....	44.8	48.8	34.1	32.5	27.4	27.2	28.4	29.0	28.0	30.1	30.2	31.1	29.5	30.5	34.4	38.0	40.7	42.4
1,000 to 4,999	....	22.4	24.0	35.0	34.5	30.5	29.9	30.9	28.9	28.8	29.9	29.3	28.9	27.5	30.9	34.8	38.9	42.8	42.7
5,000 to 9,999	....	162.2	171.0	258.2	273.2	24.0	24.6	28.4	27.0	26.4	27.4	26.1	28.6	28.7	30.7	29.6	27.2	36.6	38.1
10,000 to 24,999	....					285.3	295.0	262.5	45.1	45.9	47.4	50.6	49.3	52.1	55.6	64.4	71.8	77.0	83.1
25,000 or more	....								227.7	230.9	228.5	228.2	244.9	266.6	276.2	287.4	311.8	312.7	329.3

---

[1] Not separately available but included in total. See general notes.

[2] Data included in the other manufacturing industries group.

[3] SIC codes 3398 and 3399 included in the nonferrous metals and products group for January 1957-64.

[4] Data not tabulated at this level prior to the 1972 survey.

[5] Data not tabulated at this level prior to the 1977 survey.

[6] Included in the other electrical equipment group.

SOURCE: National Science Foundation.

Table B-35. Cost per R&D scientist or engineer by industry and size of company: 1957-58, 1963, 1967, and 1971-82

Industry and size of company	SIC code	1957	1958	1963	1967	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Total		$32,700	$32,800	$37,800	$44,100	$51,100	$55,300	$59,200	$63,300	$66,500	$72,200	$75,800	$80,400	$87,400	$94,900	$103,900	$112,800
Distribution by industry																	
Food and kindred products	20	17,200	16,800	25,200	29,500	36,600	39,500	41,400	45,200	48,900	51,400	60,100	66,000	72,300	84,900	(1)	(1)
Textiles and apparel	22,23	20,000	28,900	26,400	25,900	32,800	32,100	34,900	38,300	38,900	46,900	47,400	49,400	53,200	57,500	(1)	(1)
Lumber, wood products, and furniture	24,25	17,500	13,300	22,000	24,000	29,400	33,700	35,500	38,200	40,000	51,000	60,000	66,300	79,400	89,700	(1)	(1)
Paper and allied products	26	21,900	22,700	27,000	26,900	37,800	38,600	38,900	47,900	48,800	54,400	52,000	56,900	61,400	64,300	(1)	75,000
Chemicals and allied products	28	23,300	24,600	32,600	39,800	43,700	47,100	51,100	56,300	60,900	66,500	67,600	72,800	79,600	87,400	96,600	102,400
Industrial chemicals	281-82,286	27,400	28,400	34,800	43,900	49,200	54,000	58,600	63,500	67,500	74,700	79,600	84,200	92,800	103,400	118,000	122,000
Drugs and medicines	283	21,200	23,300	30,200	37,100	43,200	46,500	51,500	54,300	60,900	63,400	59,900	64,800	71,400	79,200	(1)	(1)
Other chemicals	284-85,287-89	14,200	15,300	27,900	29,800	35,500	33,400	34,000	45,300	43,200	50,800	53,800	61,600	66,500	66,500	(1)	(1)
Petroleum refining and related industries	29	29,500	32,600	35,400	41,500	57,700	57,100	60,400	74,900	81,500	87,200	97,700	106,000	120,800	130,400	(1)	(1)
Rubber products	30	22,800	18,700	26,500	30,600	43,100	53,100	56,100	58,300	54,900	56,700	57,800	61,600	(1)	(1)	(1)	(1)
Stone, clay, and glass products	32	(2)	(2)	26,000	36,800	39,000	43,600	45,200	48,200	51,200	57,800	59,800	62,900	67,200	73,800	(1)	(1)
Primary metals	33	21,000	24,000	35,700	41,000	41,800	44,700	49,500	55,900	61,500	61,300	65,200	70,000	79,300	91,000	107,700	122,500
Ferrous metals and products[3]	331-32,3398-99	21,700	24,600	37,400	42,200	42,400	44,200	50,200	54,800	59,700	65,600	70,100	73,900	83,300	93,300	(1)	(1)
Nonferrous metals and products[3]	333-36	20,000	23,200	33,500	41,200	41,300	44,800	48,300	57,100	63,300	57,500	60,500	65,600	74,000	87,700	(1)	(1)
Fabricated metal products	34	16,200	18,800	22,200	27,400	35,100	37,800	41,600	42,300	45,600	51,500	54,800	55,700	62,300	70,500	78,000	73,400
Machinery	35	25,600	27,500	31,000	37,400	43,100	48,000	52,400	57,500	58,900	62,800	68,600	72,600	78,900	89,900	93,900	103,200
Office, computing, and accounting machines	357	(4)	(4)	(4)	(4)	(4)	48,500	53,700	59,600	59,800	63,400	69,300	72,300	77,700	92,700	(1)	(1)
Other machinery, except electrical	351-56,358-59	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(1)	73,300	81,400	84,700	(1)	(1)
Electrical equipment	36	39,700	38,200	33,000	39,300	50,100	55,400	58,400	60,700	62,700	68,600	69,900	76,800	87,200	91,100	95,300	106,600
Radio and TV receiving equipment	365	(6)	(6)	(6)	47,400	28,400	26,700	37,500	44,300	47,600	52,000	96,000	72,200	80,300	93,400	(1)	(1)
Communication equipment	366	36,000	34,600	31,700	36,200	48,200	57,800	59,800	59,000	61,300	66,100	70,800	75,500	87,800	92,900	105,500	123,400
Electronic components	367						33,700	42,700	48,400	52,700	59,600	56,600	64,000	72,800	75,600	66,700	71,000
Other electrical equipment	361-64,369	42,800	41,900	35,400	45,800	55,300	59,700	62,200	67,700	68,000	74,700	74,200	85,100	94,900	98,300	(1)	(1)
Motor vehicles and motor vehicles equipment	371	49,400	53,800	49,400	54,700	58,900	68,100	86,500	89,500	91,100	103,700	111,700	115,600	122,900	135,200	147,400	165,600
Other transportation equipment	373-75,379						32,900	40,000	45,800	50,000	52,200	63,200	67,200	90,900	111,700	(1)	(1)
Aircraft and missiles	372,376	43,900	41,900	49,600	56,300	65,500	69,200	70,800	76,400	85,100	91,300	91,300	89,400	93,300	101,600	128,400	147,400
Professional and scientific instruments	38	23,500	25,600	29,900	40,000	49,100	53,200	56,900	60,700	63,900	66,700	71,700	79,400	83,800	89,700	93,400	(1)
Scientific and mechanical measuring instruments	381-82	22,600	23,100	18,400	28,100	28,300	32,600	34,100	38,400	42,200	46,800	55,800	64,700	(1)	(1)	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	24,700	29,100	37,500	44,500	58,300	62,800	67,700	71,500	75,300	77,900	81,100	89,700	98,400	103,800	(1)	(1)
Other manufacturing industries	21,27,31,39	(1)	(1)	23,700	39,100	35,400	40,600	43,300	47,800	51,900	51,700	53,400	57,200	61,900	77,400	(1)	(1)
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	(1)	(1)	31,000	38,300	45,000	45,600	49,300	52,400	49,700	56,500	63,200	76,600	83,500	86,400	77,200	76,300
Distribution by size of company (based on number of employees)																	
Less than 1,000		11,600	12,000	18,600	25,200	31,200	32,400	32,900	36,400	40,500	45,200	44,700	47,900	53,500	56,300	56,600	59,800
1,000 to 4,999		[7]27,200	25,100	29,400	33,700	38,100	40,600	43,200	46,700	46,800	51,600	54,100	66,100	70,200	68,600	77,000	81,500
5,000 to 9,999		[7]39,400	38,700	41,400	36,700	41,000	38,800	43,700	50,000	55,300	60,300	61,600	52,200	56,100	71,400	93,700	89,100
10,000 to 24,999					45,800	55,700	48,700	49,100	51,800	53,700	57,500	63,500	79,400	84,100	86,200	90,900	99,400
25,000 or more							63,600	68,700	72,700	76,600	82,700	80,000	88,800	96,200	105,800	117,200	129,900

Note: The number of R&D scientists and engineers derived by using the arithmetic mean of the full-time-equivalent of R&D scientists and engineers employed in the Januaries of two consecutive years.

[1] Not separately available but included in total. See general notes.
[2] Included in the other manufacturing group.
[3] SIC codes 3398 and 3399 included in the nonferrous metals and products group for 1957-63.
[4] Data not tabulated at this level prior to 1972.
[5] Data not tabulated at this level prior to 1977.
[6] Included in the other electrical equipment group.
[7] Estimated by the National Science Foundation.

SOURCE: National Science Foundation.

Table B-36. Cost per R&D scientist or engineer[1] by industry and size of company: 1982

Industry	SIC code	Companies with total employment of--					
		Total	Less than 1,000	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	$25,000 or more
Total	....	$112,799	$59,807	$81,474	$89,148	$99,420	$129,942
Food and kindred products	20	(1)	(1)	83,907	97,566	91,640	116,506
Textiles and apparel	22,23	(1)	(1)	109,268	72,991	66,497	86,383
Lumber, wood products, and furniture	24,25	(1)	73,775	90,708	202,703	(1)	(1)
Paper and allied products	26	74,523	81,340	54,046	(1)	(1)	(1)
Chemicals and allied products	28	102,421	52,181	86,046	88,789	102,113	129,811
Industrial chemicals	281-82,286	122,020	50,391	97,367	124,112	113,752	131,836
Drugs and medicines	283	(1)	(1)	60,810	72,939	102,996	(1)
Other chemicals	284-85,287-89	(1)	(1)	74,354	86,851	75,406	(1)
Petroleum refining and related industries	29	(1)	(1)	171,376	(1)	183,126	131,489
Rubber products	30	(1)	(1)	73,235	66,055	97,301	(1)
Stone, clay, and glass products	32	(1)	(1)	71,711	(1)	103,383	(1)
Primary metals	33	122,499	58,419	83,474	112,313	91,092	150,867
Ferrous metals and products	331-32,3398-99	(1)	(1)	90,584	141,327	100,826	152,359
Nonferrous metals and products	333-36	(1)	(1)	74,343	97,321	80,327	149,532
Fabricated metal products	34	73,359	38,085	99,531	75,918	97,935	76,928
Machinery	35	103,178	52,515	75,648	72,872	79,372	139,401
Office, computing, and accounting machines	357	(1)	(1)	76,826	(1)	70,542	125,635
Other machinery, except electrical	351-56,358-59	(1)	(1)	74,549	(1)	88,792	144,214
Electrical equipment	36	106,630	56,347	79,694	87,618	89,882	119,437
Radio and TV receiving equipment	365	(1)	(1)	77,885	(1)	(1)	(1)
Communication equipment	366	123,382	54,475	102,153	146,478	110,004	129,089
Electronic components	367	71,011	42,075	73,228	75,187	73,950	74,441
Other electrical equipment	361-64,369	(1)	(1)	67,651	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371	165,635	(1)	61,823	79,420	(1)	173,992
Other transportation equipment	373-75,379	(1)	(1)	71,305	(1)	(1)	(1)
Aircraft and missiles	372,376	147,427	(1)	178,010	(1)	164,284	131,473
Professional and scientific instruments	38	(1)	(1)	75,938	117,861	84,988	122,116
Scientific and mechanical measuring instruments	381-82	(1)	(1)	67,524	83,326	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	(1)	(1)	111,144	131,848	(1)	(1)
Other manufacturing industries	21,27,31,39	(1)	(1)	72,150	147,243	104,462	98,908
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	76,338	68,530	88,009	65,591	79,599	92,180

[1] See note on table B-35.
[2] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

Table B-37. Cost per R&D scientist or engineer in companies ranked by size of R&D program: 1972-82

Companies ranked by size of R&D program (based on total R&D funds)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
First 4	$64,500	$68,500	$80,700	$90,500	$102,500	$105,200	$109,400	$121,700	$126,700	$160,200	$182,100
Next 4	76,300	81,700	80,500	84,000	87,600	94,600	103,800	105,700	119,200	138,900	143,100
Next 12	63,100	73,200	76,900	80,600	82,900	79,300	83,800	90,500	93,300	107,000	114,000
Next 20	57,500	60,400	62,200	66,400	68,200	75,900	80,800	87,600	97,400	101,700	[illegible]
Next 60	51,000	52,700	66,200	61,400	65,200	69,900	74,200	80,100	90,700	96,400	105,700
Next 100	41,600	45,400	49,900	52,400	53,400	57,200	58,700	63,400	71,400	87,900	92,300
Next 200	39,700	43,600	44,000	43,600	48,300	54,200	56,900	61,200	72,800	79,900	87,200
Average of above 400 R&D performing companies	57,200	61,300	66,900	70,400	74,300	78,100	82,200	88,500	96,600	114,400	118,700
Average of R&D performing companies less above 400	28,300	29,100	32,800	40,100	44,000	44,900	46,200	47,400	56,300	58,600	61,300

Note: The number of R&D scientists and engineers is derived by using the arithmetic mean of the full-time-equivalent of R&D scientists and engineers employed in the Januaries of two consecutive years.

SOURCE: National Science Foundation.

Table B-38. Total employment of R&D-performing companies by industry and size of company: 1981-82

[In thousands]

Industry	SIC code	1981						1982					
			Companies with total employment of--						Companies with total employment of--				
		Total	Less than 1,000	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more	Total	Less than 1,000	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Total	....	17,210	1,411	1,973	1,791	3,305	8,730	16,110	1,248	1,814	1,646	3,147	8,255
Food and kindred products	20	1,298	80	157	178	363	520	1,250	69	142	173	346	521
Textiles and apparel	22,23	628	111	101	97	168	152	569	93	87	89	157	143
Lumber, wood products, and furniture	24,25	296	44	62	52	49	88	274	38	58	(^{1})	43	(^{1})
Paper and allied products	26	522	21	89	38	190	183	512	21	84	37	193	178
Chemicals and allied products	28	1,311	92	144	155	400	520	1,274	90	144	144	387	509
Industrial chemicals	281-82,286	640	19	32	75	120	393	614	19	31	71	113	379
Drugs and medicines	283	373	22	37	52	175	86	366	22	40	(^{1})	171	(^{1})
Other chemicals	284-85,287-89	299	50	75	28	105	41	294	48	72	(^{1})	104	(^{1})
Petroleum refining and related industries	29	716	7	15	10	112	572	700	(^{1})	14	(^{1})	110	560
Rubber products	30	363	58	61	36	84	123	334	53	57	36	71	118
Stone, clay, and glass products	32	405	58	55	27	186	79	354	48	44	23	172	(^{1})
Primary metals	33	1,018	44	118	101	94	661	886	38	107	83	90	568
Ferrous metals and products	331-32,3398-99	774	23	91	62	43	555	677	20	80	55	46	475
Nonferrous metals and products	333-36	244	21	27	40	50	106	209	18	26	28	44	92
Fabricated metal products	34	551	107	121	104	69	149	515	95	110	96	67	146
Machinery	35	2,077	291	315	200	357	913	1,885	234	278	218	327	828
Office, computing, and accounting machines	357	651	28	54	53	79	437	706	30	60	80	85	450
Other machinery, except electrical	351-56,358-59	1,425	263	261	147	278	476	1,179	203	218	139	242	377
Electrical equipment	36	2,240	160	210	151	322	1,396	2,144	150	200	144	314	1,336
Radio and TV receiving equipment	365	155	16	18	0	38	84	146	14	18	0	(^{1})	(^{1})
Communication equipment	366	798	36	35	25	88	614	767	33	36	27	91	580
Electronic components	367	355	44	40	49	39	184	385	46	44	48	47	200
Other electrical equipment	361-64,369	932	65	118	78	157	515	846	58	101	68	(^{1})	(^{1})
Motor vehicles and motor vehicles equipment	371	1,083	27	42	53	93	868	948	24	37	47	78	762
Other transportation equipment	373-75,379	149	7	22	15	51	54	150	(^{1})	21	(^{1})	52	55
Aircraft and missiles	372,376	949	11	25	38	109	766	930	15	25	34	108	748
Professional and scientific instruments	38	842	108	86	76	76	497	731	94	80	68	73	416
Scientific and mechanical measuring instruments	381-82	501	57	47	32	49	316	398	46	45	(^{1})	(^{1})	230
Optical, surgical, photographic, and other instruments	383-87	341	50	39	43	27	181	334	49	35	(^{1})	(^{1})	186
Other manufacturing industries	21,27,31,39	733	79	119	98	183	255	706	73	107	90	175	260
Nonmanufacturing industries	07-17,41-67,737, 739,807,891	2,028	104	231	362	399	932	1,947	98	220	290	383	955

[1] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

37.

Table B-39. R&D scientists and engineers per 1,000 employees by industry and size of company: 1958, 1963, 1967, and 1971-82

Industry and size of company	SIC code	1958	1963	1967	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Distribution by industry																
Total	....	21	28	27	26	24	24	25	26	27	27	27	27	27	29	32
Food and kindred products	20	6	7	7	7	7	7	7	7	7	7	7	6	5	6	6
Textiles and apparel	22,23	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Lumber, wood products, and furniture	24,25	5	4	4	7	6	7	7	7	7	7	7	6	6	(1)	(1)
Paper and allied products	26	6	6	6	8	8	8	8	10	12	12	14	14	14	16	16
Chemicals and allied products	28	39	40	36	41	39	39	40	41	40	42	43	42	42	44	50
Industrial chemicals	281-82,286	42	40	33	35	34	36	37	38	36	38	38	36	36	37	43
Drugs and medicines	283	46	47	51	65	60	57	57	59	64	62	65	62	60	66	76
Other chemicals	284-85,287-89	30	38	33	31	31	29	30	29	28	29	27	27	30	33	35
Petroleum refining and related industries	29	15	17	18	17	16	17	18	19	17	17	19	18	17	20	22
Rubber products	30	19	20	17	15	16	17	17	18	18	19	18	(1)	(1)	25	(1)
Stone, clay, and glass products	32	(1)	12	14	11	10	10	11	11	11	12	13	13	13	13	14
Primary metals	33	5	5	5	5	5	5	5	7	8	8	8	7	7	8	9
Ferrous metals and products[2]	331-32,3398-99	4	4	4	4	4	4	4	5	5	5	6	6	6	6	8
Nonferrous metals and products[2]	333-36	6	8	8	8	7	8	7	11	15	13	12	12	12	13	15
Fabricated metal products	34	16	15	14	11	10	11	11	12	12	12	12	12	14	15	15
Machinery	35	22	28	28	29	31	31	34	36	38	38	39	38	36	35	40
Office, computing, and accounting machines	357	(3)	(3)	(3)	(3)	66	65	69	76	79	78	79	75	72	71	69
Other machinery, except electrical	351-56,358-59	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	18	19	19	18	19	23
Electrical equipment	36	43	55	43	38	37	37	37	40	42	42	41	43	44	48	52
Radio and TV receiving equipment	365	(5)	(5)	18	35	26	20	18	16	15	17	22	29	35	51	(1)
Communication equipment	366	52	67	52	43	42	43	43	44	45	46	48	53	55	56	61
Electronic components	367					39	40	40	49	55	54	51	52	55	66	66
Other electrical equipment	361-64,369	37	41	35	32	31	31	32	36	38	35	32	32	32	34	(1)
Motor vehicles and motor vehicles equipment	371	16	19	20	22	23	22	24	25	25	24	26	26	30	30	32
Other transportation equipment	373-75,379					14	13	13	13	14	13	13	11	9	9	8
Aircraft and missiles	372,376	72	99	89	74	76	68	72	72	78	85	96	93	92	98	102
Professional and scientific instruments	38	44	36	32	33	33	34	35	38	41	41	42	41	39	46	(1)
Scientific and mechanical measuring instruments	381-82	57	38	26	31	31	33	35	41	45	45	50	(1)	(1)	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	33	35	35	33	34	35	35	37	38	41	44	45	48	47	(1)
Other manufacturing industries	21,27,31,39	(1)	9	6	7	6	6	6	7	8	7	9	7	7	7	8
Nonmanufacturing industries	07-17,41-67,737, 739,807,891		9	13	22	21	18	17	16	19	16	14	13	11	12	15
Distribution by size of company (based on number of employees)																
Less than 1,000	....	18	27	28	29	28	26	29	26	25	24	25	24	25	28	33
1,000 to 4,999	....	12	19	16	18	19	17	17	17	17	17	18	18	19	21	24
5,000 to 9,999	....	25	31	15	18	19	18	18	17	19	20	17	19	19	18	23
10,000 to 24,999	....			31	28	16	16	16	17	18	19	20	19	20	23	25
25,000 or more	....					31	31	33	35	34	35	34	34	34	36	39

Note: The number of R&D scientists and engineers for 1982 is derived by dividing the arithmetic mean of scientists and engineers employed in January 1982 and January 1983 by the number of company employees in all activities in March 1982. Similar procedures were used in earlier years except 1967-69 in which data were derived by dividing the worker-years of R&D scientists and engineers for the year by the March employment figures.

[1] Not separately available but included in total. See general notes.
[2] SIC codes 3398 and 3399 included in the nonferrous metals and products group for 1958-63.
[3] Data not tabulated at this level prior to the 1972 survey.
[4] Data not tabulated at this level prior to the 1977 survey.
[5] Included in the other electrical equipment group for 1958-63.

SOURCE: National Science Foundation.

Table B-40. Total and company R&D funds per employee by size of company: 1963 and 1967-82

Size of company (based on number of employees)	1963	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
	Total R&D funds per employee																
Total.............	$1,110	$1,180	$1,210	$1,220	$1,250	$1,300	$1,386	$1,468	$1,624	$1,728	$1,912	$2,077	$2,240	$2,453	$2,576	[illegible]	$3,660
Less than 1,000........	520	660	(1)	(1)	840	920	892	863	1,010	1,043	1,139	1,051	1,123	1,254	1,418	1,634	1,991
1,000 to 4,999.........	580	570	(1)	(1)	770	690	757	758	791	786	852	963	1,066	1,321	1,326	1,596	1,920
5,000 to 9,999.........	1,310	560	690	670	720	750	736	790	879	930	1,138	1,261	1,143	1,102	1,332	1,668	2,024
10,000 to 24,999.......		1,470	1,450	1,450	1,470	1,540	781	773	837	920	1,041	1,215	1,407	1,569	1,768	2,045	2,529
25,000 or more.........							1,962	2,127	2,421	2,644	2,829	2,994	3,045	3,614	3,594	4,193	5,051
	Company R&D funds per employee																
Total.............	$470	$580	$610	$660	$710	$760	$818	$905	$1,040	$1,112	$1,233	$1,347	$1,487	$1,650	$1,764	$2,059	$2,477
Less than 1,000........	360	420	(1)	(1)	510	590	579	580	657	810	893	879	933	956	1,176	1,333	1,570
1,000 to 4,999.........	340	370	(1)	(1)	470	480	525	540	572	642	699	790	841	910	1,108	1,311	1,564
5,000 to 9,999.........	520	420	470	500	580	620	609	663	729	749	921	1,004	989	987	1,048	1,323	1,619
10,000 to 24,999.......		660	690	740	800	850	557	598	688	791	842	927	1,077	1,237	1,414	1,675	2,069
25,000 or more.........							1,059	1,204	1,432	1,519	1,651	1,781	1,873	2,271	2,273	2,641	3,130

Note: Averages were derived by dividing total and company R&D funds for a calendar year by employment figures for March of that year.

[1] Not separately available but included in total. See general notes.

SOURCE: National Science Foundation.

section c

reproduction of survey instruments

page
National Science Foundation covering letter 42
Bureau of the Census covering letter for Form RD-1 43
Instructions 44
Form RD-1 48
Form MA-121 50

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

nsf

OFFICE OF THE
DIRECTOR

Dear Respondent:

The National Science Foundation requests the cooperation of your company in completing the enclosed questionnaire for the 1982 survey of industrial research and development.

This is the third time that an abbreviated version of this annual survey is being used. In 1978, the Foundation began to alternate between the complete survey form, which was sent to you last year, and a shorter version which requests companies to provide only selected data elements. The purpose of instituting this system was to reduce the reporting burden on firms, and we sincerely hope that this objective is being accomplished.

Since industry accounts for approximately 70 percent of total R&D performance in the United States, the survey is a major source of information used in evaluating scientific and technological innovation in this country. The data obtained from the survey are essential in the formulation of effective public policies which will stimulate and strengthen industry's performance of research and development. In addition, we have often been advised that individual firms find the data valuable in assessing and planning their own R&D programs.

A recent release containing key findings from last year's survey is enclosed. A more detailed report, providing substantial additional data, is expected to be available later in the spring. The Foundation will be pleased to send your firm a copy. Requests should be sent to Dr. Charles E. Falk, Director, Division of Science Resources Studies, Room L-602, National Science Foundation, Washington, D. C. 20550.

The data obtained from the survey are collected and compiled by the U.S. Bureau of the Census for the National Science Foundation. Inquiries regarding the survey should be directed to the U.S. Department of Commerce, Bureau of the Census, Washington, D. C. 20233.

Sincerely yours,

Edward Knapp

Edward A. Knapp
Director

Enclosure

RD-1-L2 (12-27-82)

RD-1-L1 (1982)
(12-1-82)

UNITED STATES DEPARTMENT OF COMMERCE
Bureau of the Census
Washington, D.C. 20233

OFFICE OF THE DIRECTOR

FROM THE DIRECTOR
BUREAU OF THE CENSUS

We are enclosing your report form and file copy for the "Survey of Industrial Research and Development During 1982" (RD-1). We are also enclosing an instruction manual to assist you in completing the report and a letter from the National Science Foundation, which sponsors this survey, describing the importance of the survey results.

To minimize response burden, we alternate between a "long" and a "short" form every other year. The "short" version is being used for 1982. This report form is basically unchanged from the 1980 version.

Please read the instruction manual carefully, since it provides guidelines for reporting. We recognize that book records for particular items may not be maintained. In such cases, carefully prepared estimates are acceptable.

This report is authorized by law (title 13, United States Code). Items 2A and 2B and columns 2 and 4 of item 5C are part of the basic statistical program of the Bureau of the Census for manufacturing companies, and reporting of these items is mandatory. Response to the remainder of the inquiries is voluntary; however, your cooperation is needed to make the results of the survey comprehensive and accurate. By section 9 of the same law (title 13), your report to the Census Bureau is confidential. It will be seen only by sworn Census Bureau employees and used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

Requests for copies of the resulting publication or any questions concerning this survey should be directed to Mr. William Starr of our Industry Division on (301) 763–5598. We appreciate your past cooperation in this important survey and look forward to your continued participation.

Sincerely,

Bruce Chapman

BRUCE CHAPMAN

Enclosures

FORM **RD-1**
(10-25-82)
(Instruction Manual)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATION

INSTRUCTIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1982

Outline of instructions

GENERAL

Page
Information about reporting: Additional forms 1
Companies new to survey 1
Preposted figures 1
Revision of figures 2
Coverage – reported unit, period 2
Section I – GENERAL COMPANY DATA 2
Item 2 – Sales and Employment for Company 2
DEFINITION OF RESEARCH AND DEVELOPMENT 2
Section II – RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY IN THE UNITED STATES 2
Item 4 – Number of Research and Development Scientists and Engineers 2–3
Cost or Receipts for Research and Development Performed Within the Company by Source of Funds 3
Item 5 – Column 2, Federal 3–4
Item 5 – Column 3, Company and Other, Except Federal 4
Item 5C – Funds Budgeted for 1983 4
Item 6 – Research and Development by Functional Category 4
Section III – REPORTING OF RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE OF COMPANY WITH COMPANY FUNDS 4
Item 7 – Total Company Funds Spent for Research and Development Activities Performed by Foreign Affiliates Outside the United States 4

GENERAL

Information About Reporting: Additional Forms – Reporting on this form may require that companies resort to the use of estimates in answering some of the questions. We are satisfied, however, that the comparability of data among companies with research and development programs is sufficient to develop meaningful totals and measures of changes from year to year.

If you require additional copies of the form, write to the Bureau of the Census, 1201 East Tenth Street, Jeffersonville, Indiana 47132. If you have any questions regarding reporting on this form, write to the Bureau of the Census, ATTN: Industry Division, Washington, D.C. 20233, or call Area Code (301) 763–5598.

Companies Reporting in Survey for the First Time – Companies not reporting in 1981 survey should fill in the figures for both years. If the company had no expenditures for research and development, complete only "Item 2." Enter "No R&D" in the space for remarks on page 2 of the form, sign and return the form.

Figures for Earlier Years are Preposted on the Form – If your company reported on form RD-1 for 1981, certain figures from that form have been copied to the present form. Please describe in the "Remarks" section (page 2 of the form) the reasons for any substantial increases or decreases in the 1982 figures entered on this form when compared to corresponding 1981 figures. Examples of such reasons are new government contracts, acquisitions and disposals, revised accounting method, etc. If you acquired or disposed of a unit performing an important amount of research and development during the 2-year period, please identify the unit in remarks, and give the total amount of research and development accounted for by such unit.

Revision of Earlier Year Figures — The 1981 figures should be revised if necessary to assure comparability with 1982 data. Please explain in remarks, any significant change in the 1981 figures. If your company did not report for 1981 or no entries have been entered in the 1981 column, fill in the figures for both years.

Report for Your Entire Company — Research and development activities for your entire domestic company should be reported, including all subsidiaries and divisions of the company. If you desire to have subsidiaries report separately, please write to the Bureau of the Census and list your subsidiaries.

Period Covered by Report — The figures reported should cover the calendar year if at all possible. However, fiscal year data are acceptable for all items except employment, provided your fiscal year ends between September and March. Please report employment figures (items 2B and 4) for the period identified in each of the items mentioned.

Section I — GENERAL COMPANY DATA

Item 2 — Sales and Employment for Company — In item 2A, report the net sales and receipts of this company and its subsidiaries to customers outside the company. (Exclude domestic intra-company transfers and sales by foreign subsidiaries, however, include transfers to such foreign subsidiaries; and export sales to foreign companies.) The reported figures should represent value f.o.b. plant after discounts and allowances and should not include freight charges; excise taxes should be excluded. In item 2B report the number of persons employed at the company in all activities in the 50 States and the District of Columbia during the pay period which includes the 12th of March 1981 and 1982. This figure would be the same as that shown by the company in item 3 of Treasury Form 941, if the company filed one form 941 for the entire company.

DEFINITION OF RESEARCH AND DEVELOPMENT

Research and development includes basic and applied research in the sciences and in engineering, and design and development of prototype products and processes. For the purposes of this questionnaire, research and development includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.

2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.

3. Apply existing knowledge to problems involved in the improvement of a present product or process.

Research and development includes the activities described above whether assigned to separate research and development organizational units of the company or carried on by company laboratories and technical groups not part of a research and development organization. We recognize that the reporting activities of such latter groups will require the use of estimates for some of the questions.

Activities to be Excluded From Research and Development — Research and development for purposes of this survey does not include quality control, routine product testing, market research, sales promotion, sales service, research in the social sciences or psychology, or other nontechnological activities or technical services.

More specifically, exclude from research and development such nontechnological activities as market research, including statistical surveys of product acceptance, estimates of market size, and studies of channels of distribution; market development, including the sale of either old or new products to obtain acceptance of them in new outlets; economic research and other research in the social sciences; and legal work in connection with patent applications and litigation and the sale or licensing of patents.

Also exclude from research and development such technical services as: quality and quantity control tests and analyses, troubleshooting in connection with breakdowns in full-scale production, including related analytical work; technical plant sanitation control; work required for minor adaptations of a specific product to meet the requirements of a specific customer, including installation and servicing in a customer's plant; engineering and other technical service furnished in accordance with agreements to licensees outside the company; aid furnished by the research and development organization to manufacturing divisions to enable them to operate in accordance with previously determined formulas, standard practice instructions, or finished product specifications; aid furnished to develop advertising programs and to promote or demonstrate new products or processes, including the cost of material furnished for trial or demonstration; assistance in preparation of speeches and publications for persons not engaged in research and development; and experimental work performed at the request of the patent division to provide information needed during the prosecution of a patent litigation.

Section II — RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY, IN THE UNITED STATES

Item 4 — Research and Development Scientists and Engineers — Scientists and engineers for this survey are defined as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics, equivalent at least to that acquired through completion of a four-year college course with a major in these fields, regardless of whether they held a college degree in the field.

As in the past, the figure on R&D scientists and engineers will be obtained primarily from two sources:

1. Records on the number of scientists and engineers assigned to research and development. This source is satisfactory so long as the scientists and engineers of the unit are assigned to research and development on a full-time basis (i.e, no more than 5 percent of their time is spent on nonresearch and development). For example, for company laboratories performing only research and development, report the number of scientists and engineers on the rolls in January. For other units, use source 2.

2. Figures on the proportion of total work time of scientists and engineers that is devoted to research and development. For example, if the engineering department of a manufacturing plant had 60 scientists and engineers in January 1982 and one-fourth of the scientists' and engineers' time during that month was charged to research and development projects, the figure for the number of research and development scientists and engineers included for that unit would be 15.

Cost or Receipts for Research and Development Performed Within the Company by Source of Funds — Include all costs incurred to support research and development, exclusive of capital expenditures, but including depreciation and overhead. If you perform research and development for others on contract, include the total charged for the work performed, including profit.

The relevant costs usually include but are not limited to the elements listed below:

1. Wages, salaries, and related costs. Material and supplies consumed (or purchased, if consumption figures are not available); utilities, such as telephone, telegraph, electricity, water, gas, and fuel; books and periodicals; travel and entertainment costs and professional dues.

2. Property taxes and other taxes (except income taxes) incurred on account of the research and development organization or on the facilities which the research and development organization uses. Insurance expense. Maintenance and repair, including the maintenance of buildings and grounds, depreciation on buildings, equipment, and vehicles; or rentals, if any facilities are leased.

3. Company overhead. Estimate a fair share of the cost of any functions which support research and development activities. The basis and method of estimating overhead costs will depend upon company practice. The important point is to be sure that all companies include an allowance for overhead. Items normally covered in overhead include the following:

Personnel, including personnel, medical and safety departments, and employee or industrial relations department; accounting control and fiscal (Treasurer's office); procurement and inventory, including purchasing, receiving, inspection, storage, transportation, control, and issue of materials and supplies; other services, including legal, public relations, shopwork, analytical work, plant protection, rearrangement of facilities, drafting, printing, duplicating, transportation of material and personnel, maintenance of motor vehicles, messenger service, stenographic service, and photography; salaries and related costs of research executives not on the payroll of the research and development organization.

Do not net your research and development expenditures by the amount of royalties received from either noncompany organizations or company units; or the credits received for research and development work charged or "sold" to other departments or divisions of reporting company or to outside organizations.

Types of Expense to be Excluded From Research and Development Costs — Exclude from the cost of research and development performed within the company the cost of research and development carried on for the company by noncompany research and development organizations of any kind; or fellowships, grants, and gifts to promote research and development or the study of the sciences and engineering. That part of company-held research and development contracts subcontracted to research and development organizations outside reporting company. All work that was done for your laboratories and other technical units by noncompany organizations which are not research and development organizations (for example, model construction by a noncompany model shop) is to be considered as a purchase of equipment, material, or supplies for the company research organization rather than as subcontracted research and development.

Also exclude capital expenditures, royalties paid, patent expense, income taxes, or interest. Income from sale of products manufactured in the research and development organization if these were sold to bona fide customers

Item 5 — Research and Development Performed Within the Company by Source of Funds

This item provides separate columns for reporting in 1982 the costs of research and development in Federal contracts and subcontracts, and Company and Other research and development. Definitions of "Federal," and of "Company and Other" are provided below.

Source of Funds — A separate column in item 5 is provided for each of the following:

Item 5, Column 2 — Federal — Include the cost of work done on research and development contracts or subcontracts, and research and development portions of procurement contracts and subcontracts during the year.

Do not include here, or elsewhere in the report, research and development contracts and the portions of procurement contracts that you subcontracted to other research and development organizations. To do so would cause duplication in the statistical totals derived from these reports.

Item 5, Column 3 — Company and Other — Include the cost of all company-sponsored research and development performed within the company. Research and development is performed by a few manufacturing companies for other non-Federal organizations. Such research and development should be included in this column.

In item 5C, report the expected or estimated cost of company-sponsored research and development that will be performed within the company during 1983.

Item 6 — Research and Development by Functional Category

Energy Research and Development — Include all R&D spending whose purpose is to increase energy resources or capabilities, including the development of energy equipment. Some R&D spending is for joint or multiple purposes. In these instances, estimate and report the portion of cost incurred due to the energy purpose. Energy R&D can include costs of R&D projects (both product and process) on exploration, extraction, transportation, processing, storage, generation (including conversion), distribution, conservation, etc., of present, new, or improved forms of energy. Record energy R&D spending according to type of energy.

"All other energy" includes areas such as geothermal, solar, conservation and utilization, wind, waste, hydroelectric, etc. Also include in this category, (C), the development of energy equipment which cannot be readily classified in A and B. If the energy source is waste or any other area with pollution abatement aspects, consider carefully whether one of the purposes of the project is pollution abatement.

In a limited number of cases, the separation of joint (multiple) costs which is encouraged in the preceding paragraph may not be feasible. In this circumstance, include total project cost if the primary purpose of a project is energy R&D; do not include any of project cost if the primary purpose of the project is other than energy R&D.

Pollution Abatement Research and Development — Pollution abatement R&D spending for the purpose of reducing or eliminating the emission of pollutants. As used here, abatement includes prevention, treatment, or recycling; pollution refers to the emission of pollutants to the outside of a firm's (or household's) property or activities. Do not include R&D spending to contribute to environmental aesthetics, to increase equipment durability in corrosive environments, to conserve energy (include as energy R&D) and natural resources, or to increase employee comfort, safety, and health.

There can be two types of pollution abatement R&D spending. In some cases, the only purpose of the R&D spending is pollution abatement. Examples are spending on projects to improve or design alternatives to electrostatic precipitators, wet scrubber systems, waste treatment systems, effluent monitoring devices, etc. In such cases, include the total expenditures on the R&D project. In other cases, pollution abatement is one of several purposes. Examples are spending on projects to improve production processes or products and simultaneously reduce the emission of pollutants. Pollution abatement purposes could also be combined with other types of environmental control purposes such as energy conservation or employee safety and health. In all these instances, estimate and report only the portion of cost incurred due to the pollution abatement purpose.

In a limited number of cases, the separation of joint (multiple) costs which is encouraged in the preceding paragraph may not be feasible. In this circumstance, do not include any of project cost unless the primary purpose of the project is pollution abatement. When the primary purpose is pollution abatement, include the total project cost in your answer.

Do not include any of project cost as being for pollution abatement if expected pollution abatement benefits are incidental. Incidental benefits are those obtained at no extra cost.

Section III — RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE COMPANY — (R&D not included in item 5)

Item 7 — Total Company Funds Spent for Research and Development Activities Performed by Foreign Affiliates Outside the United States — Report the amount of research and development financed by the U.S. parent or its foreign affiliates performed in R&D laboratories, branch plants, divisions, and subsidiaries located outside the United States.

This item excludes R&D activities performed in foreign affiliates financed by foreign governments or other outside organizations.

NOTE: Foreign affiliates are those outside the 50 States or the District of Columbia.

DUE DATE: 60 DAYS AFTER RECEIPT OF FORM O.M.B. No. 3145-0027: Approval Expires July 31, 1984

FORM **RD-1**
(11-18-82)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATION

SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1982

RETURN TO
Bureau of the Census
1201 East Tenth Street
Jeffersonville, Indiana 47132

Name of person who supplied 1981 data

NOTE: Data supplied in items 2A and 2B and in item 5A, columns 2 and 4, for 1982 on this form, will satisfy the mandatory reporting requirement of Census Form MA-121 (title 13, U.S. Code). Although you are not required to complete the other items, your cooperation on these voluntary items is needed to make the results of this survey comprehensive, accurate, and timely.

NOTICE – Your report to the Census Bureau is confidential by law (title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

Item 1 – NAME AND ADDRESS OF COMPANY – *Please correct any error in name and address including ZIP code*

Group	Survey
4	4001

PLEASE RETURN THIS COPY

CENSUS USE ONLY	1	2	3	4	5	6

GENERAL INSTRUCTIONS

- Please complete and return this form in the envelope provided within 60 days. Retain the file copy for your records. This report should cover your entire company, including all subsidiaries and affiliates, unless otherwise designated.
- Enter "None" where appropriate rather than leaving a blank space.
- Reasonably accurate estimates are acceptable.
- Be sure 1981 and 1982 figures are comparable.

PLEASE READ ENCLOSED INSTRUCTIONS BEFORE COMPLETING THIS FORM

Section I – GENERAL COMPANY DATA

Item 2 – DOMESTIC SALES, RECEIPTS, AND EMPLOYMENT FOR COMPANY	**CT1**	**1981** 1	**1982** 2
A. Domestic net sales and receipts of this company *(Thousands of dollars)*	**2001**	**$**	**$**
B. Total domestic company employment in all activities during the pay period which includes the 12th of March 1981 and 1982.	**2002**		

Item 3 – RESEARCH AND DEVELOPMENT EXPENDITURES
Are research and development expenditures for entire domestic company, including subsidiaries and affiliates, reported on this form? . . . . ☐ Yes ☐ No – *Please explain in remarks or on transmittal letter*

Section II – RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY IN THE UNITED STATES
(Exclude R&D financed by the company but performed by others.)

Item 4 – NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS *(See instruction Manual, page 3)*	**CT2**	**January 1982** 1	**January 1983** 2
TOTAL →	**3099**		

Item 5 – COST OR RECEIPTS FOR REASERCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY SOURCE OF FUNDS	**CT2**	*Thousands of dollars*			
		1981	**1982**		
		TOTAL 1	Federal funds 2	Company and other funds except Federal 3	**TOTAL** *(Sum of columns 2 and 3)* 4
A. **TOTALS** →	**3599**	**$**	$	$	$
B. **1981 TOTALS** →			**$**	**$**	**$**
C. Company and other funds, except Federal, budgeted for the year 1983 →			**CT1** **3800**	$	▨

Please continue on reverse side

Section II – R&D PERFORMED WITHIN THE COMPANY IN THE UNITED STATES – Continued

(Exclude R&D financed by the company but performed by others.)

Item 6 – RESEARCH AND DEVELOPMENT BY FUNCTIONAL CATEGORY ***(Of the total reported in Item 5A,*** **COSTS OR RECEIPTS FOR RESEARCH AND DEVELOPMENT,** ***columns 2 and 4, report the following functional categories.)***

ENERGY RESEARCH AND DEVELOPMENT Include the project cost or portion of project cost incurred for the purpose of increasing energy resources or capabilities. Include cost by type of energy. *If "None," please mark (X)* . . . . ☐ 80996	CT2	*Thousands of dollars*				
		1981		**1982**		**1983**
		Federal funds 1	Total funds 2	Federal funds 3	Total funds 4	Total projected costs 5
A. Total nuclear	8010	$	$	$	$	$
B. Total fossil fuels	8020					
C. All other energy	8060					
D. TOTAL of A through C ⟶	8099	$	$	$	$	$
POLLUTION ABATEMENT RESEARCH AND DEVELOPMENT – Include the project cost or portion of the project cost incurred for the purpose of designing pollution abatement products or product characteristics or of designing pollution abatement features into processes. Include cost by form of pollution to be abated. *If "None," please mark (X)* . . . . ☐ 81996	CT2	*Thousands of dollars*				
		1981		**1982**		**1983**
		Federal funds 1	Total funds 2	Federal funds 3	Total funds 4	Total projected costs 5
TOTAL ⟶	8199	$	$	$	$	$

Section III – RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE DOMESTIC COMPANY

(Not included in item 5 with company funds.)

Item 7 – TOTAL COMPANY FUNDS SPENT FOR RESEARCH AND DEVELOPMENT ACTIVITIES PERFORMED BY FOREIGN AFFILIATES OUTSIDE THE UNITED STATES *If "None," please mark (X)* . . . . ☐ 11603	CT2	*Thousands of dollars*	
		1981 1	**1982** 2
	1160	$	$

Remarks – ***Attach additional sheet if necessary***

Name of person to contact regarding this report	Address – *Number and street, city, State, ZIP code*	Telephone		
		Area code	Number	Extension

Period covered by this report

☐ Calendar year ☐ Fiscal year – *Specify* ⟶

From – *Month/day/year*

To – *Month/day/year*

CERTIFICATION – This report is substantially accurate and has been prepared in accordance with instructions.

Name of company	Address – *Number and street, city, State, ZIP code*	
Signature of authorized official	Title	Date

FORM RD-1 (11-18-82)

DUE DATE: 15 DAYS AFTER RECEIPT OF FORM

O.M.B. No. 3145–0027: Approval Expires July 31, 1984

FORM **MA-121**
(11-17-82)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

NOTICE – Response to this inquiry is required by law (title 13, U.S. Code, sections 131, 182, 224, and 225). By section 9 of the same law, your report to the Census Bureau is confidential. It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

COMPANY SUMMARY OF RESEARCH AND DEVELOPMENT

1982

(Please correct any error in name and address including ZIP code)

Group	Survey
4	9901

RETURN TO

Bureau of the Census
ATTN: Industry Division
Washington, D.C. 20233

Please complete and return this form in the return envelope not later than 15 days after you receive it. Companies with no research and development expenditures should so state in the "Remarks" section, fill in items 1a and 1b, sign, and return the form.

PLEASE RETURN THIS COPY

PLEASE READ INSTRUCTIONS ON REVERSE SIDE BEFORE COMPLETING YOUR REPORT

Item 1 – SALES AND EMPLOYMENT FOR COMPANY	**C.T.1**	*(Thousands of dollars)*
a. Net sales and receipts of this company and its subsidiaries during 1982	**2001**	**$**
b. Number of employees in this company in all activities in the 50 States and the District of Columbia during the pay period which includes the 12th of March 1982	**2002**	*(Number)*

		1982 *(Thousands of dollars)*		
	C.T.2	Federal funds [1]	Company and other funds, except Federal [2]	**TOTAL** *(Sum of columns 1 and 2)* [3]
Item 2 – COST OR RECEIPTS FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY DURING 1982	**3599**	**$**	**$**	**$**

Remarks

Name of person to contact regarding this report	Address *(Number and street, city, State, ZIP code)*	Telephone *(Area code, number, and extension)*

CERTIFICATION – This report is substantially accurate and has been prepared in accordance with instructions.

Name of company	Address *(Number and street, city, State, ZIP code)*

Signature of authorized official	Title	Date

▶ GENERAL INSTRUCTIONS

A report should be filed by each company receiving a copy of this form. If your company does not conduct research and development, so state in remarks, fill in items Ia and Ib, sign, and return the form. If you have questions regarding reporting problems on this form, please write to the Bureau of the Census, Industry Division, Washington, D.C. 20233.

Report for your entire company – Research and development activities for your entire domestic company should be reported.

Period covered by report – The cost figure reported should cover the calendar year if at all possible. However, fiscal year data are acceptable, provided your fiscal year ends between September and March.

▶ DEFINITION OF RESEARCH AND DEVELOPMENT

Research-development includes basic and applied research in the sciences (including medicine) and in engineering, and design and development of prototypes, products, and processes. It does not include quality control, routine product testing, market research, sales promotion, sales service, research in the social sciences or psychology, or other nontechnological activities or technical services.

▶ SPECIFIC INSTRUCTIONS BY ITEM

Item 1 -- Sales and Employment for Company. In item Ia, report the net billings of this company and its subsidiaries to customers outside the company. (Exclude domestic intra-company transfers and sales by foreign subsidiaries. Include the transfers to such foreign subsidiaries, however.) In item Ib, report the number of persons employed by the company in all activities in the 50 States and the District of Columbia during the pay period which includes the 12th of March 1982.

This figure would be the same as that shown by the company in item I of Treasury Form 941, if the company filed one form 941 for the entire company.

Item 2 – Show all costs incurred within the company for wages and salaries, direct material costs, services and supporting costs, and an appropriate share of company overhead to conduct research and development activities.

Under Federal funds, include research and development in procurement as well as research and development contracts and research and development subcontracts. Exclude research and development subcontracted to others.

Remarks (Continued)

FORM MA-121 (11-17-82)

other science resources publications

Science Resources Studies Highlights

R&D Funds

	NSF No.	Price
"Non-Federal Funding for Academic R&D Activities Increased at a Faster Pace than Federal Funding in Fiscal Year 1982"	84-307	-----
"Federal Academic Obligations Increased Increased by 13% in 1982, 5% in Real Dollars"	84-305	-----

S/E Personnel

	NSF No.	Price
"Science and Engineering Employment in Academia Grew 3% in 1983"	84-317	
"Graduate Science/Engineering Enrollment Grew 3% in 1983"	84-313	-----
One-fourth of Academic Research Equipment Classified Obsolet"	84-312	-----
1982 Doctorate Production Stable in Science and Engineering Fields, But Down in Science and Mathematics Education"	83-830	-----
"No Change in Science and Engineering Student Quality Seen by 60% of Academic Officials: At Least 25% Perceive Improvement"	83-322	-----
"Growth in Neuroscience May be Leveling Off"	83-322	-----

Detailed Statistical Tables

R&D Funds

	NSF No.	Price
Academic Science/Engineering: R&D Funds, Fiscal Year 1982	84-308	-----

S/E Personnel

	NSF No.	Price
U.S. Scientists and Engineers: 1982	84-321	-----
Charateristics of Recent Science/Engineering Graduates: 1982	84-318	-----
Academic Science/Engineering: Scientists and Engineers, January 1983	84-309	-----
Academic Science/Engineering: Graduate Enrollment and Support, Fall 1982	84-306	-----
Science and Engineering Doctorates: 1960-82	83-328	-----

Reports

R&D Funds

	NSF No.	Price
Federal Support to Universities, Colleges, and Selected Nonprofit Institutions: Fiscal Year 1982	84-315	-----

S/E Personnel

	NSF No.	Price
Projected Response of the Science, Engineering, and Technical Labor Market to Defense and Nondefense Needs: 1982-87	84-304	-----
Women and Minorities in Science and Engineering	84-300	-----

Composite

	NSF No.	Price
Academic Science/Engineering: 1972-83, R&D Funds, Federal Support, Scientists and Engineers, Graduate Enrollment and Support	84-322	-----
A Guide to NSF Science/Engineering Resources Data	84-301	-----
Science and Technology Data Book	83-318	-----